adansonia

1998 • 20 (2)

Éditions scientifiques du Muséum, Paris

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Éditions scientifiques du Muséum, Paris

Index des nouveautés taxonomiques et nomenclaturales
publiées dans Adansonia 20 (2), 1998

Endemic families of Madagascar. I. A synoptic revision of *Melanophylla* Baker (Melanophyllaceae)

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ABSTRACT
In preparation for an assessment of the conservation status of all taxa in the vascular plant families endemic to Madagascar and the Comoro Islands, to be compiled as a Red Data Book under the auspices of the IUCN, a synoptic revision of *Melanophylla* Baker (Melanophyllaceae) is presented. Recent molecular sequence data support the exclusion of *Melanophylla* from Cornaceae (under which it was originally treated for the Flore de Madagascar), and suggest instead placement at the base of Araliales sister to *Aralidium* Miq. Critical comparison of all available herbarium material leads us to recognize six species, one of which, *M. modestei*, is described as new; four formerly recognized species are placed in synonymy. A key to the species is provided in English and French.

KEY WORDS
Madagascar, endemic families, *Melanophylla*, Melanophyllaceae.

RÉSUMÉ

Une révision synoptique du genre *Melanophylla* Baker (Melanophyllaceae) est présentée, en vue d'évaluer l'importance, pour la conservation, des taxons appartenant aux familles de plantes vasculaires endémiques de Madagascar et des Comores, afin d'élaborer un Livre Rouge sous l'égide de l'UICN. Des données moléculaires récentes justifient l'exclusion de *Melanophylla* des Cornaceae, famille dans laquelle il a été placé dans la Flore de Madagascar, et indiquent plutôt une position à la base des Araliales, à côté du genre *Aralidium* Miq. L'étude de l'ensemble des spécimens disponibles nous permet de reconnaître six espèces, dont une nouvelle (*M. modestei*) ; quatre espèces sont mises en synonymie. Une clé de détermination est fournie en anglais et en français.

MOTS CLÉS
Madagascar,
familles endémiques,
Melanophylla,
Melanophyllaceae.

INTRODUCTION

The flora of Madagascar is characterized by an extremely high level of endemism, perhaps approaching 80% at the species level, and by a remarkable array of habitat types, ranging from perhumid tropical forests to semiarid deserts (KOECHLIN et al. 1974; LOWRY et al. 1997). Among the endemic taxa, a subset can be distinguished that exceeds all others in conservation importance: those that belong to the nine families endemic to Madagascar and the adjacent Comoro Islands. These groups are in a very real sense the «most endemic of the endemic», representing evolutionary lines that in some cases had wider distributions in the past, but through extinction now exist nowhere else.

Under the auspices of IUCN – The World Conservation Union, the Missouri Botanical Garden in collaboration with the Association Nationale pour la Gestion des Aires Protégées (ANGAP) in Madagascar has initiated a project to compile a Red Data Book on the Malagasy endemic vascular plant families, whose goal is to assess the conservation status of all species in the families Asteropeiaceae, Didiereaceae, Didymelaceae, Diegodendraceae, Kaliphoraceae, Melanophyllaceae, Physenaceae, Sarcolaenaceae, and Sphaerosepalaceae. The project will utilize Geographic Information System (GIS) technology to analyze distributions in relation to bioclimate, geology, remaining vegetation, and threat, supplemented by additional field population biology studies. The first step in such a project is a critical review of the existing taxonomy in each family, particularly in light of new collections.

KERAUDREN (1958b) treated the endemic *Melanophylla* Baker (Melanophyllaceae) along with a second endemic genus, *Kaliphora* Hook. f., as members of Cornaceae for the Flore de Madagascar et des Comores. Subsequently, AIRY SHAW (1972) superfluously described *M. pachypoda* based on an isotype of *M. madagascariensis* (later correctly placing it into synonymy [AIRY SHAW 1973]), as well as validating with a Latin diagnosis the family name Melanophyllaceae first proposed by TAKHTAJAN (1970). AIRY SHAW suggested that *Melanophylla* was more closely related to Escalloniaceae and Araliaceae, respectively, on the basis of leaf toothing and the sheathing petiole base, rather than to Cornaceae sensu stricto. EYDE (1988) argued for exclusion of *Melanophylla* from the core of Cornaceae, along with several other anomalous genera including *Kaliphora*. Recent molecular sequence data have confirmed the exclusion of various genera from Cornaceae s.s. (XIANG et al. 1993), and have provided inference of their possible relationships. Parsimony analysis of chloroplast *mat*K and *rbc*L sequences place *Melanophylla* sister to *Aralidium* Miq. (Aralidiaceae) at the base of Araliales along with *Griselinia* J.R. Forst. & G. Forst. (Griseliniaceae) and *Toricellia* DC. (Toricelliaceae) (PLUNKETT et al. 1996, 1997). Insofar as *Aralidium* is restricted to West Malesia, i.e., west of Wallace's Line, the common ancestor of *Melanophylla* and *Aralidium* may have been

distributed across Madagascar/Greater India during the late Cretaceous, with the ancestor of *Aralidium* surviving «Noah's Ark» rafting on Greater India after its separation from Madagascar ca. 88 million years ago (STOREY et al. 1995), followed by dispersal into W. Malesia and extinction in India (SCHATZ 1996).

Melanophyllaceae differ from Cornaceae by their alternate versus opposite leaves (rarely alternate in Cornaceae) with a distinctly sheathing petiole base; glandular capitate hairs versus biramous hairs; axillary (but often appearing pseudoterminal) paniculate inflorescences versus terminal umbellate, corymbiform, capitate, or rarely paniculate inflorescences; 5-merous versus 4-merous flowers with imbricate versus valvate petals; free versus fused styles; and a reduced to absent versus distinct nectary disc. In addition, Melanophyllaceae have 2-3 locules, only one of which is fertile with a single pendulous ovule versus 2 locules, each with a single ovule in Cornaceae. Molecular sequence data also confirm that *Kaliphora madagascariensis* Hook. f. is best treated as representing a monotypic endemic family close to Montiniaceae at the base of Solanales (R. OLMSTEAD pers. comm. to GES).

Based upon a detailed comparison of morphological features using all the material of *Melanophylla* at K, MO, P, TAN, and TEF, the following revised taxonomy is proposed. Six species are recognized, of which one (*M. modestei*) is newly described; additional material accrued since the Flore de Madagascar treatment by KERAUDREN (1958b) leads us to place four formerly recognized species into synonymy. For the «Material examined» cited below under each species, abbreviations are as follows: PN = Parc National; RNI = Réserve Naturelle Intégrale; RS = Réserve Spéciale; STF = Station Forestière. Full exsiccatae with complete localities and latitude/longitude coordinates have been compiled in the context of the Madagascar Conspectus Project (SCHATZ et al. 1996), and are available on the World Wide Web through W3 TROPICOS (*http://mobot.mobot.org/Pick/Search/pick.html*).

TAXONOMIC TREATMENT

Key to the species of *Melanophylla*

1. Inflorescence main axis 36-60 cm long; leaf blade 27-56 × 8-22 cm .... 5. **M. modestei**
1'. Inflorescence main axis 3.5-29 cm long; leaf blade 3.5-28 × 1.5-15 cm 2
2. Leaf blade thick coriaceous, 15-28 cm long 3
2'. Leaf blade thin chartaceous to membranous, 3.5-25 cm long, or if sub-coriaceous, then never exceeding 10(-12) cm long 4
3. Leaf margins slightly revolute; flower buds 2.5 mm long, petals 3.5 mm .... 4. **M. madagascariensis**
3'. Leaf margins strongly revolute; flower buds 4.5-5 mm long, petals 5.5 mm ....6. **M. perrieri**
4. Inflorescence bifid, each axis a raceme; rarely one or both of the axes once-branched near the base, petals yellow; fruit 14-16 mm long .... 3. **M. crenata**
4'. Inflorescence a well-branched pyramidal panicle, petals white; fruit 6-11 mm long 5
5. Leaf blade sub-coriaceous, 3.5-10(-12) cm long; inflorescence main axis 4-12.5 cm long; twigs slender, petiole base 1-3 mm broad; plants occurring from (900-)1,000-1,800 m altitude ....1. **M. alnifolia**
5'. Leaf blade thin chartaceous, 8.5-25 cm long; inflorescence main axis 12-30 cm long; twigs stout, petiole base (2-)6-11 mm broad; plants occurring from 250-1,000 m altitude .... 2. **M. aucubifolia**

In order to facilitate identification of *Melanophylla* material in Madagascar, the key is also given in French.

Clé des espèces de *Melanophylla*

1. Axe principal de l'inflorescence long de 36-60 cm ; limbe foliaire 27-56 × 8-22 cm .... 5. **M. modestei**
1'. Axe principal de l'inflorescence long de 3,5-29 cm ; limbe foliaire 3,5-28 × 1,5-15 cm 2

2. Limbe foliaire épais, coriacé, long de 15-28 cm 3
2'. Limbe foliaire mince, cartacé à membraneux, long de 3,5–25 cm, ou s'il est subcoriacé ne dépassant pas 10(-12) cm 4
3. Marge de la feuille légèrement révolutée ; boutons floraux longs de 2,5 mm, pétales de 3,5 mm .... 4. **M. madagascariensis**
3'. Marge de la feuille fortement révolutée ; boutons floraux longs de 4,5-5 mm, pétales 5.5 mm .... 6. **M. perrieri**
4. Inflorescence bifide, chaque axe en racème, rarement un ou les deux axes uni-branchés près de la base, pétales jaunes ; fruit long de 14-16 mm .... 3. **M. crenata**
4'. Inflorescence en panicule pyramidale rameuse, pétales blancs ; fruit long de 6-11 mm 5
5. Limbe foliaire sub-coriace, long de 3,5-10(-12) cm ; axe principal de l'inflorescence long de 4-12,5 cm ; rameaux minces, base du pétiole large de 1-3 mm ; plantes s'étageant de (900-)1000 à 1800 m d'altitude .... 1. **M. alnifolia**
5'. Limbe foliaire mince, cartacé, long de 8,5-25 cm ; axe principal de l'inflorescence long de 12–30 cm ; rameaux épais, base du pétiole large de (2-)6-11 mm ; plantes s'étageant de 250 à 1000 m d'altitude. .... 2. **M. aucubifolia**

1. **Melanophylla alnifolia** Baker

J. Linn. Soc., Bot. 21: 352 (1886).—Type: *Baron 3240*, Madagascar, without precise locality (holo-, K!; iso-, P (2)!).

Melanophylla capuronii Keraudren, «*Capuronii*», Bull. Soc. Bot. France 55: 253 (1958).—Type: *Service Forestier (Capuron) 8806*, Prov. Antsiranana or Toamasina, Massif du Beanjada, N de la Presqu'île Masoala, 1000 m (holo-, P!; iso-, K!, MO!, P (2)!, TEF!); *syn. nov.*

Melanophylla alnifolia is a small to medium tree 5–15 m tall, or rarely a large tree over 20 m tall, occurring at mid to high elevation (1,000–1,800 m) from the massifs of Manongarivo RS and Marojejy RNI in the north to Ranomafana PN in the south. It can be recognized by its sub-coriaceous leaves with usually distinctly revolute margins, which are crenate-serrate mostly in the upper 1/4–1/3, and with an often sub-truncate apex. The twigs are slender, and consequently the sheathing petiole base is rather narrow (1.2–3 mm broad). The inflorescence of *M. alnifolia* is a narrowly pyramidal, relatively open panicle bearing flowers with white petals.—Fig. 1A.

Melanophylla capuronii was distinguished from *M. alnifolia* on the basis of leaves that had dried green as opposed to black (almost certainly a function of rapid drying), and thick, recurved styles, which are probably a reflection of the developmental stage (late female phase of protandrous flowers/early to mature fruit with styles still attached). Otherwise, all other aspects of the flowers, fruit and vegetative parts of *Service Forestier (Capuron) 8806* conform to *M. alnifolia*, as well as its occurrence at 1,000 m altitude on Mt. Beanjada to the north of the Masoala Peninsula.

VERNACULAR NAMES.—Briaty, Hazomborondreo, Marefolena, Sirambengy.

MATERIAL EXAMINED.—*Baron 3097*, *3240*, without precise locality; *Cours 879*, Moramanga, *3750*, Anjanaharibe-Sud RS; *Guillaumet 4171*, Marojejy RNI; *Herb. St. Agric. Alaotra 94*, s.loc.; *Humbert 24625*, Anjanaharibe-Sud RS, *31503*, *31628*, Marojejy RNI; *Miller 4598*, Marojejy RNI; *Rakoto 340*, Ranomafana PN; *Randrianasolo 90*, Marojejy RNI; *Ravelonarivo 95*, Anjanaharibe-Sud RS; *Schatz 2895*, Masoala PN, *3552*, Ambohitantely RS; *Service Forestier 937*, Anjanaharibe-Sud RS, *7880*, *7995*, Manankazo-Ankazobe SF, *8806*, Beanjada, *11453*, Manongarivo RS, *20164*, Ambohitantely RS, *21923*, *21924*, Sandrangato.

2. **Melanophylla aucubifolia** Baker

J. Linn. Soc., Bot. 21: 352 (1886), « *aucubaefolia* ».—Type: *L. Kitching s.n.*, Madagascar, without precise locality (holo-, K!).

Melanophylla humblotii Drake, « *Humbloti* », in Grandidier, Hist. Phys. Madagascar, pl. 400 (1896).—Type: Plate 400 (undoubtedly based upon *Humblot 517*). [In the Flore de Madagascar treatment (KERAUDREN 1958b), BAILLON was incorrectly cited as the author of the name, and 1894 as the publication date for Plate 400]; *syn. nov.*

Melanophylla humbertiana Keraudren, Bull. Soc. Bot. France 55: 253 (1958).—Type: *Humbert 24531*, Prov. Antsiranana, Massif de l'Anjanaharibe, 900m (holo-, P!; iso-, P (2)! [*Cours 3659* (K!, P!) and *Herb.*



Fig. 1.—Flowering specimens of ***Melanophylla*** species: **A,** ***M. alnifolia*** (*Schatz 3552*); **B,** ***M. modestei*** (*Lowry et al. 4150*).

Inst. Sci. Madagascar 3659 (TAN (2)!, MO!) are the same gathering as *Humbert 24531*, and thus are additional isotypes]); *syn. nov.*

Melanophylla aucubifolia is a small tree 5–8 m tall occurring from 250–1,000 m altitude from the Marojejy RNI to Andringitra RNI. It can be recognized by its thin textured leaves when dried, which usually have dentate toothing in the upper 1/2 or even 3/4, although the margins may occasionally be nearly entire; leaf shape varies from oblong to broadly elliptic. The twigs are usually stout and light-colored, with the sheathing petiole base consequently broad ([2-] 6–11 mm) and contrastingly black when dried, and the petiole often quite long (to 12.5 cm). The inflorescence of *M. aucubifolia* is a long, open, broadly pyramidal panicle bearing flowers with white petals.

Melanophylla humbertiana was distinguished from *M. aucubifolia* by KERAUDREN (1958a) on the basis of rounder teeth and more flowers per inflorescence, whereas *M. humblotii* was distinguished primarily by its nearly entire leaf margins. The presence and form of teeth is highly variable throughout the genus, especially within *M. aucubifolia*, and appear to vary with local conditions, as also does the number of flowers per inflorescence.

VERNACULAR NAMES.—Hazomalany, Singaramantingoro, Tsiboratiala.

MATERIAL EXAMINED.—*Andrianarisata 253*, Betampona RNI; *Cours 3659*, Anjanaharibe-Sud RS, *4781*, *4802*, *4912*, Didy; *D'Alleizette 773*, Mandraka STF; *Herb. Inst. Sci. Madagascar 3659*, Anjanaharibe-Sud RS; *Herb. St. Agric. Alaotra 3659* (= *Herb. Inst. Sci. Madag. 3659*), Anjanaharibe-Sud RS; *Humbert 24531*, Anjanaharibe-Sud RS; *Humblot 517*, without precise locality; *Kitching s.n.*, without precise locality; *Lewis 895*, Andringitra RNI; *Lowry 4282*, Mantadia PN; *Miller 4242*, Marojejy RNI; *Perrier de la Bâthie 18358*, Ambatovola; *Rakotomalaza 732*, Marojejy RNI; *Réserves Naturelles 4533*, Betampona RNI; *Service Forestier 1602*, Analamazaotra-Périnet RS, *8984*, Amboditavolo, *11538*, Analamazaotra-Périnet RS, *24029*, Saharanga, *24380*, Marozevo, *33854*, Mantady PN.

3. Melanophylla crenata Baker

Hook. Icon. Pl., t. 2499 (1896).—Lectotype (here designated): *Forsyth-Major 296*, Prov. Fianarantsoa, Ambohimitombo (K!).

Melanophylla longipetala Keraudren, Bull. Soc. Bot. France 55: 251 (1958).—Type: *Service Forestier (Capuron) 6699bis*, Prov. Toamasina, Forêt de Sandrangato, S de Moramanga (holo-, P!; iso-, MO!, P (2)!, TEF (2)!); *syn. nov.*

Melanophylla crenata is a shrub to small tree 3–8 m tall occurring from 300–1,380 m and ranging from just north of the Zahamena RNI to the region of Andohahela PN. It is easily recognized by its bifid inflorescence, each axis forming a raceme of widely spaced flowers, with occasionally one or rarely both of the axes once-branched near the base, bearing flowers with yellow petals. The twigs are slender, with the current year's growth drying black and the previous year's wood nearly white, and the sheathing petiole base is correspondingly narrow (0.5–3 mm broad).

Melanophylla longipetala was based on a collection with petals only 1–2 mm longer than other material; it nevertheless has the characteristic inflorescence of *M. crenata*, which is unique within the genus. *Melanophylla crenata* appears to be the only species in the genus with yellow petals, and it is further distinguished by having fruit that are considerably larger than the other two species with which it may be sympatric (*M. alnifolia* and *M. aucubifolia*).

BAKER (1896) cited three syntypes when he described *M. crenata* (*Forsyth-Major 118*, *296* and *382*), from which we have selected number *296* as the lectotype because it exhibits a fully developed, characteristic inflorescence with flowers at anthesis.

VERNACULAR NAMES.—Hazoporetaka Kivoso, Marefilena, Kibontongatra, Sirambengy, Tafara Vavaporetaka.

MATERIAL EXAMINED.—*Cours 2819* (= *Herb. Inst. Sci. Madag. 2819*), Amboditafonana, *4342* (= *Herb. Inst. Sci. Madag. 4342*), Andrebevava, *4664*, *4715*, *4717*, Didy; *Forsyth-Major 181*, *296*, *352*, Ambohimitombo; *Humbert 6621*, Marosohihy; *Kotozafy 352*, Ranomafana PN; *Lewis 847*, *860*, Andringitra RNI; *Malcomber 1633*, Ranomafana PN; *Nicoll 127*, Ranomafana PN; *Noyes 988*, Mantadia PN; *Perrier de la Bâthie 18057*, Ambinaniango, *18357*, Ambatovola; *Rakoto 284*, *433*, Ranomafana

PN; *Réserves Naturelles 6100*, Zahamena RNI; *Service Forestier 1258*, Ampamaherana STF, *1494*, Pic d'Ivohibe RS, *2042*, Ampamaherana STF, *5852*, *6508*, Andrambovato STF, *6699bis*, Sandrangato, *22356*, Andohahela PN, *24163*, Andriandavibe, *25410*, *25504*, Ambodigavo, *28401*, Antanandava, *34312*, Beforana; *Turk 256*, *571*, Ranomafana PN.

4. **Melanophylla madagascariensis** Keraudren

Bull. Soc. Bot. France 55: 251 (1958).—Lectotype (here designated): *Humblot 437*, Madagascar, without precise locality (P!; iso-, K!, P!).
Melanophylla pachypoda Airy Shaw, Kew Bull. 26: 491 (1972), nom. superfl.—Type: *Humblot 437* (holo-, K!; iso-, P (2)!).

Melanophylla madagascariensis is known only from the type collection from the region of Antsianaka (probably to the east of Didy) and two collections from Betampona RNI, none of which note the habit or size of the plant. This species shares thick coriaceous leaves when dried with *M. perrieri*, from which it can be distinguished by its slightly revolute leaf margins, compact inflorescence, and smaller flowers borne in a dense, contracted pyramidal panicle; the color of the petals is unknown.

VERNACULAR NAME.—Bararaty.

MATERIAL EXAMINED.—*Humblot 437*, without precise locality; *Réserves Naturelles 5904*, *8312* (= *Service Forestier 17300*), Betampona RNI.

5. **Melanophylla modestei** G.E. Schatz, Lowry & A.-E. Wolf, **sp. nov.**

Differt a speceibus aliis Melanophyllis *foliis longioribus, axe principali inflorescentiae longiore, et fructibus majoribus.*

TYPE.—*Schatz & Modeste 3131*, Madagascar, Prov. Toamasina, hills just E of Ambanizana to the N of the Androka River, 15°37'30"S, 49°58'30"E, 25-250 m, 10 Jan. 1991, fr. (holo-, MO!; iso-, K!, P!, TAN!).

Unbranched to sparsely branched small tree to 6 m tall, stems 1–2 cm diam. Leaves clustered toward the apex of the stems, the petiole 6.8–15 cm long, deeply channeled, winged from the base to 7–11 mm from the apex, the strongly sheathing amplexicaul base 5–11 mm broad, the blade oblanceolate to broadly obovate, broader above the middle, 27–56 × 8–22 cm, the base acute to cuneate and slightly asymmetrical, the margin subentire to acute dentate-serrate in the upper third, the apex obtuse to abruptly acuminate, the venation craspedodromous, with 10–13 pairs of straight secondary veins, these often branching as low as midway to the margin, often with 1-several additional branches, each basal to the main secondary and also terminating at the margin, rarely semicraspedodromous with the ultimate side branches from a secondary vein joining just before the margin, the midrib channeled above, conspicuously raised below, the blade somewhat succulent when fresh with the texture of cabbage, drying thin chartaceous, black. Inflorescences axillary, appearing pseudo-terminal, erect, a many-branched, open panicle, the main axis 36–49 cm long, often bearing a narrowly lanceolate bract toward the base, 40 × 7 mm, with many smaller bracts along the length of main axis and lateral branches, the first branch 1 cm from the base, 22 cm long, the next branch 4.5 cm from base, 22 cm long, the third branch at 12.5 cm, 16 cm long, and then 7–10 additional branches, each becoming progressively shorter; flowers borne in the axil of an ovate, ciliate bract, 3–4 × 1–3 mm, pedicel 5 mm long, light purple, bearing at its apex a bilobed, light purple involucel comprised of two fused bracteoles, 1.5 mm across, the margin ciliate; fused calyx 2 mm across, 1.5 mm high, light purple, the margin irregularly truncate, ciliate; petals 5, narrowly elliptic, 7–8 × 2–3 mm, dark pink to purple outside, pale pink inside, imbricate in ellipsoid bud, reflexed at anthesis; stamens 5, the filaments slender, 3–4 mm long, white, the anthers basifixed, ovate, 4–4.5 × 2 mm, the base sagittate, the apex acute, yellow; ovary inferior, 3-locular, narrowly ellipsoid to obovoid, 2.5 mm long, 2 mm diam., finely pubescent, styles 3, linear, 4 × 0.4 mm; ovule 1, apically pendulous in one locule, the other two locules sterile. Fruit a fleshy drupe, ovoid to ellipsoid, 14–18 mm long, 7–11 mm in diam., the endocarp with a hard, stony ridge above the fertile locule, less lignified around the two sterile locules; mature seeds unknown.—Figs. 1B, 2.

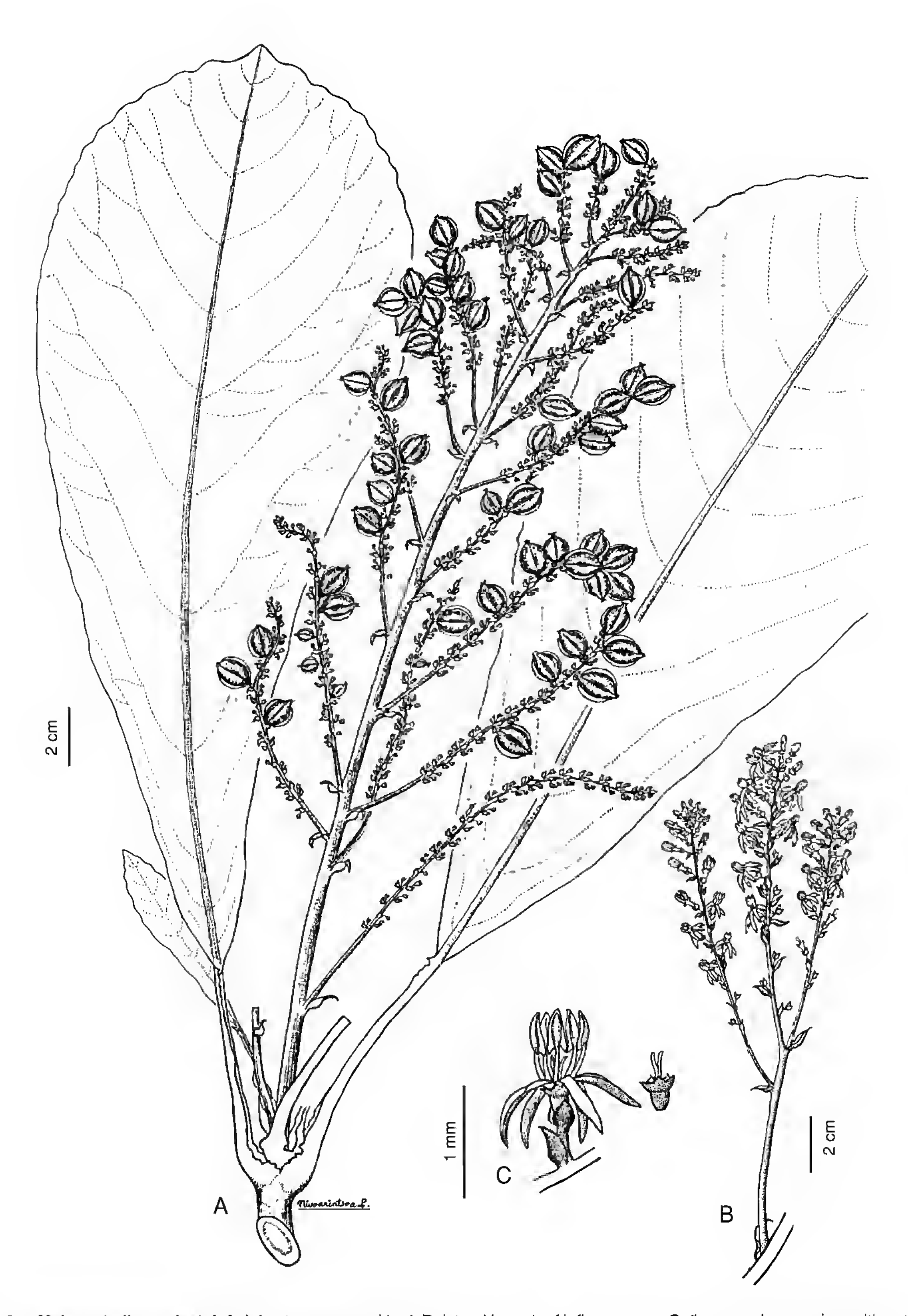


Fig. 2.—***Melanophylla modestei*: A,** infructescence and leaf; **B**, lateral branch of inflorescence; **C**, flower and gynoecium with petals removed. (A, *Schatz & Modeste 3131*; B, C, *Lowry et al. 4149*).

PARATYPES.—From the type locality: *Aridy & Lowry 280*, 1 Mar. 1998, st. (MO!, TAN!); *Lowry, Rakotozafy & Nicoll 4149*, 16 Oct. 1986, fl., fr. (K!, MO!, P!, TAN!); *Lowry, Rakotozafy & Nicoll 4150*, ibid. (MO!, P!, TAN!); *Rakotozafy 2079*, Oct. 1986, fl. (TAN!); *Schatz, van der Werff, Gray & Razafimandimbison 3319*, 25 Oct. 1992, fl. (K!, MO!, P!).

Melanophylla modestei is known only from the type locality in lowland humid evergreen forest on slopes just east of Ambanizana on the Bay of Antongil side of the Masoala Peninsula, at the edge of the newly established Masoala PN. It is easily distinguished from all other *Melanophylla* species by its extremely large leaves, which are succulent and cabbage-like when fresh and thin chartaceous when dried, and equally large, open, paniculate inflorescences bearing flowers with pink petals. The fruits are also the largest recorded in the genus. A photograph of *M. modestei* can be seen on the Madagascar Conspectus Web site at (*http://www.mobot.org/MOBOT/Madagasc/melano.html*).

The species epithet honors our good friend and colleague Georges MODESTE, with whom we have spent many wonderful days exploring the magnificent rain forests around the Bay of Antongil, and for whom the new Parc National Masoala is a great source of pride. *Melanophylla modestei* grows a mere stone's throw from his back door.

6. Melanophylla perrieri Keraudren

Bull. Soc. Bot. France 55: 251 (1958), «*Perrieri*».— Type: *Perrier de la Bâthie 8709*, Prov. Toamasina, haute Sakaleona, 450 m (holo-, P!; iso-, P!).

Melanophylla perrieri is a small, sparsely branched tree 3–6 m tall, known from the type collection in the upper basin of the Sakaleona River to the east of Ambositra, and a second specimen from Mananara Nord. It shares thick, coriaceous leaves when dried with *M. madagascariensis*, from which it can be distinguished by its strongly revolute leaf margins, more elongate inflorescence and larger flowers with pink petals.

VERNACULAR NAME.—Baritra.

MATERIAL EXAMINED.—*Perrier de la Bâthie 8709*, Ambalafary, haute Sakaleona; *Service Forestier 26108*, Ambalavala, Mananara Nord.

Acknowledgements

We wish to thank S. ANDRIAMBOLOLONERA, J. RAHARIMAMPIONONA, and K. SIKES for specimen and data management; L. NIVOARINTSOA for the fine illustration; and Ph. MORAT and his staff for hospitality extended at the Laboratoire de Phanérogamie in Paris. Field work was conducted under collaborative agreements between the Missouri Botanical Garden and the Parc Botanique et Zoologique de Tsimbazaza and the Direction de la Recherche Forestière et Piscicole, Antananarivo, Madagascar. We gratefully acknowledge courtesies extended by the Government of Madagascar (Direction Générale de la Gestion des Ressources Forestières) and by the Association Nationale pour la Gestion des Aires Protégées. This research was conducted with support from U.S. National Science Foundation grants DEB-9024749 and DEB-9627072 and from the John D. and Catherine T. MACARTHUR Foundation, the Liz CLAIBORNE and Art ORTENBERG Foundation, and the National Geographic Society.

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Manuscript received 29 May 1998;
revised version accepted 15 September 1998.

Pittosporum lanipetalum (Pittosporaceae), nouvelle espèce de Nouvelle-Calédonie

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MOTS CLÉS
Pittosporum,
Pittosporaceae,
Nouvelle-Calédonie.

RÉSUMÉ
Une nouvelle espèce de *Pittosporum*, affine de *P. gracile* par ses fleurs longuement pédicellées en fascicules terminaux, est décrite et illustrée. Elle se distingue en particulier par ses pétales extérieurement couverts d'un dense trichome laineux et par ses graines mûres non collantes.

KEY WORDS
Pittosporum,
Pittosporaceae,
New Caledonia.

ABSTRACT
A new species of *Pittosporum*, related to *P. gracile* because of its flowers with long pedicels in terminal fascicles, is described and illustrated. It is distinguished mainly by the exterior of its petals being densely covered with woolly hairs and by its mature seeds not being sticky.

Les plantes endémiques de Nouvelle-Calédonie sont souvent liées aux roches ultramafiques (péridotites et serpentines) ; cependant certaines de ces espèces ont été trouvées sur un substrat différent, en particulier sur les schistes du puissant ensemble métamorphique du Nord-Est de la Grande-Terre. En 1968, Hugh et Margaret MACKEE ont exploré un secteur particulièrement accidenté, celui des Roches de Ouaième qui surplombent la rivière de même nom dans le Massif du Ton-Non. Ils ont ainsi remarqué et récolté un *Pittosporum*, localement abondant, mais dont la population semble isolée dans ces maquis d'altitude. Le trichome laineux qui recouvre extérieurement les pétales constitue le caractère le plus remarquable de cette nouvelle espèce et l'épithète spécifique y fait référence.

Cette étude entre dans le cadre de la révision de la famille des Pittosporaceae pour la Flore de la Nouvelle-Calédonie, qui a déjà donné lieu à quatre publications (TIREL & VEILLON 1995a, 1995b, 1997 ; BOUCHET et al., 1995).

Pittosporum lanipetalum Tirel & Veillon, **sp. nov.**

Floribus longipedicellatis et fasciculatis P. gracile *affine, sed petalibus flavis extra dense lanatis, capsulis minoribus plerumque 2-valvatis, maturis seminibus eviscosis praecipue differt.*

TYPE. — *MacKee 18234*, Nouvelle-Calédonie, Roches de Ouaième, 900 m, 10 jan. 1968, fl., fr. (holo-, P ; iso-, NOU, P).

Arbuste dressé, peu ramifié, de 0,5-1 m. Rameaux à écorce gris ± foncé. Jeunes pousses robustes, couvertes d'une dense pilosité laineuse rousse, pourvues de cataphylles (d'abord écailleuses et emboitées à la base puis oblongues, de 1-2 cm, s'échelonnant avant la touffe foliaire précédant l'inflorescence). Feuilles en nombreux pseudoverticilles denses et serrés sur les extrémités ; pétiole mal individualisé ou trapu, de 0,5-1(-2) cm ; limbe étroitement obové, de 3-9(-13) × 1-2,5(-3,5) cm, obtus-arrondi au sommet, en coin à longuement et régulièrement atténué à la base, à marge épaissie et révolutée ; jeunes feuilles à trichome laineux très dense des deux côtés, feuilles adultes complètement glabres et brillantes surtout à la face supérieure, vert foncé au-dessus, vert clair jaunâtre en dessous, fonçant beaucoup au séchage, très coriaces, un peu à fortement récurvées. Nervure médiane très proéminente en dessous, nervures secondaires indistinctes ou 6-10 paires un peu saillantes en dessous et formant avec les nervilles un réseau lâche ; sur le sec, nervation parfois imprimée à la face supérieure.

Inflorescences terminales en fascicules de 2-12 fleurs à longs pédicelles de 3-6 cm, laineux ; petites bractées basales généralement cachées par les jeunes feuilles. Calice peu évasé, à 5 sépales libres, étroitement ovés-linéaires, de 8 mm env., aussi longs que le tube de la corolle, à dense revêtement laineux roux à l'extérieur ainsi qu'à l'intérieur dans la moitié supérieure. Corolle hypocratériforme-campanulée, à lobes et intérieur jaune soufre ; tube de 7-10 mm, à 5 pétales d'abord connivents, libres en fin d'anthèse, extérieurement à dense revêtement laineux se prolongeant un peu sur les lobes ; lobes étroitement ovés, longs de 3-5 mm, fortement récurvés à l'anthèse, glabres intérieurement. Étamines 5, n'atteignant pas tout à fait la gorge ; anthères oblongues et brièvement apiculées, longues de 2,5-3 mm ; filets de 4-6,5 mm, assez larges, amincis au sommet. Pistil de 7-10 mm, à ovaire ± renflé, à revêtement de poils longs et très denses, à style cylindrique à subconique, à stigmate un peu élargi, 4-lobé ; nombreux ovules sur 2 (exceptionnellement 3) placentas pariétaux.

Fruits longuement pédonculés, à l'extrémité des rameaux, parfois ultérieurement déportés latéralement ; capsules ovoïdes-oblongues, de 1,5-2,5 × 1-1,5 cm, à style persistant, brunes à maturité, sur le sec à surface finement granuleuse et à paroi épaisse de 1-2 mm ; 2 valves (très rarement 3) bombées, se séparant jusqu'à la base. Graines 25-70 par capsule, brunes, non collantes à maturité, longues de 5 mm sur le sec. — Fig. 1.

PARATYPES. — *MacKee 19190*, Roches de Ouaième, sommet est, 982 m, 13 juil. 1968, fr.(P) ; *MacKee 33536*, leg. *Cherrier*, ibid., versant est, 800 m, 16 juil. 1977, fr. (P) ; *MacKee 34098*, leg. *Cherrier*, ibid., 650 m, 20 oct. 1977, st. (P) ; *MacKee 34463*, leg. *Cherrier*, ibid., 850 m, 22 déc. 1977, fl. (P) ; *MacKee 36007*, leg. *Cherrier*, ibid., 25 oct. 1978, fl. (P) ; *Veillon 2274*, ibid., 750 m, 19 juin 1971, fr. (NOU, P).

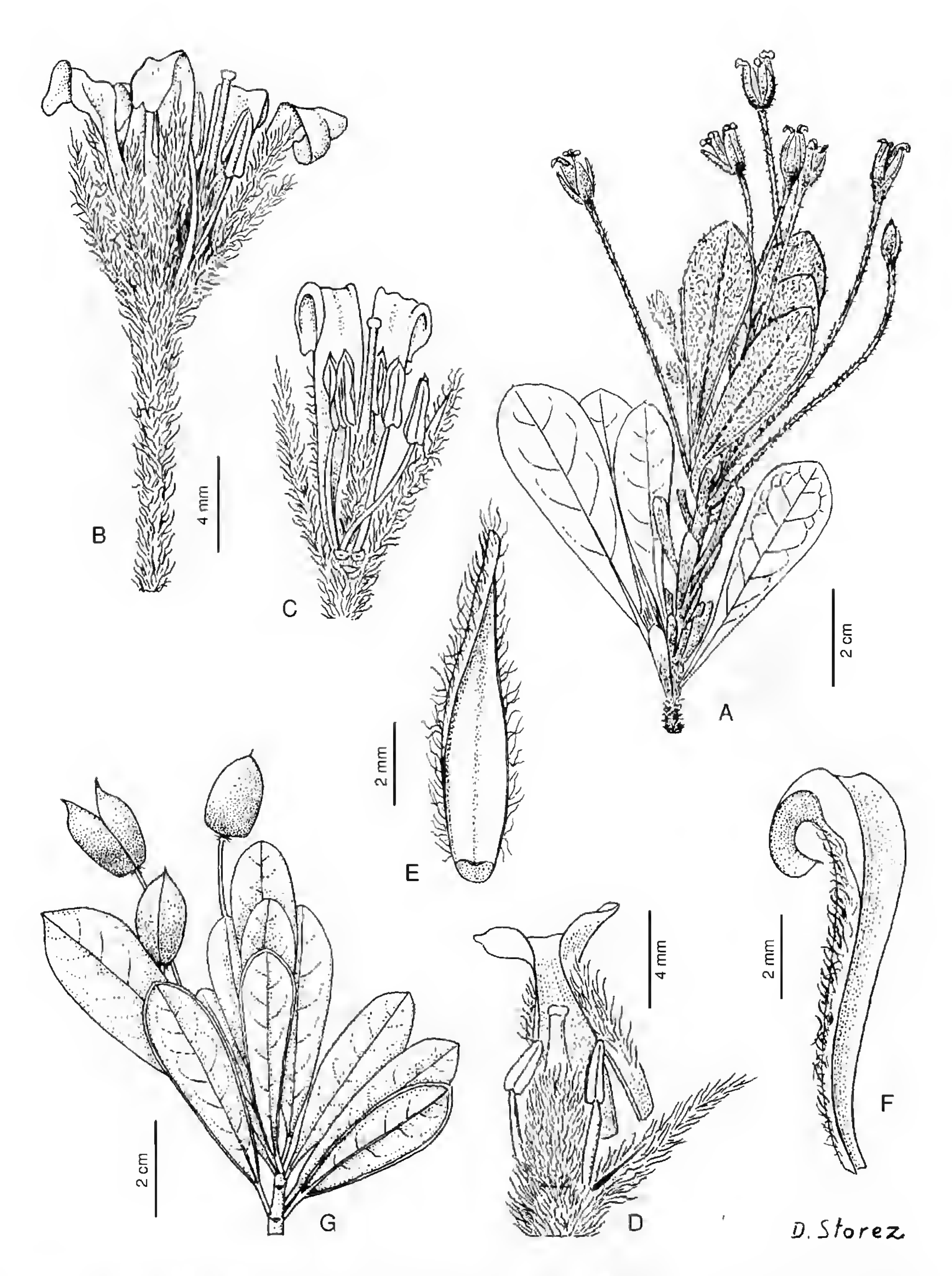


Fig. 1. — ***Pittosporum lanipetalum*** : **A**, rameau florifère ; **B**, fleur, vue d'ensemble ; **C**, fleur à pistil élancé et longues étamines, périanthe partiellement enlevé ; **D**, fleur à pistil trapu et étamines plus courtes ; **E**, sépale, vue interne ; **F**, pétale, vue latérale ; **G**, rameau fructifère. (A-F, G, *MacKee 18364* ; D, *MacKee 34463*).

Avec ses fleurs fasciculées et longuement pédicellées, cette espèce paraît proche de *P. gracile*, mais chez ce dernier le tube de la corolle est toujours glabre et de couleur rouge foncé extérieurement. Chez *P. lanipetalum* les fruits, plus petits, ne sont pas nettement rétrécis à la base ; les capsules à 3 valves sonr exceptionnelles alors qu'elles représentent le cas le plus fréquent chez *P. gracile*. La pulpe visqueuse qui enroure les graines de *Pittosporum*, même sur herbier, les maintenant collées les unes aux autres (elle est à l'origine du nom de genre), est très peu abondante dans cette espèce et disparaît au cours de la maturation.

En Nouvelle-Calédonie, une seule autre espèce, *P. koghiense*, possède des pétales à revêtement pileux mais moins dense et argenté ; il ne peut y avoir de confusion avec cet autre *Pittosporum* chez lequel les pédicelles ne dépassent pas 8 mm, les fleurs sont de couleur rouge à brune et les feuilles étroitement elliptiques, beaucoup plus petites.

Alors que dans la plupart des espèces néocalédoniennes, certains pieds portent des fleurs à minuscules étamines stériles et à ovaire fertile, donc fonctionnellement ♀, nous n'avons trouvé aucune fleur de ce type parmi les échantillons de *P. lanipetalum*. Toutes les fleurs ont des étamines à anthères bien développées, même lorsque le filet est relativement court et que le pistil est trapu avec un ovaire renflé et visiblement fécond.

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Manuscrit reçu le 11 mai 1998 ;
version révisée acceptée le 24 juillet 1998.

Revision of the genus *Blotia* (Euphorbiaceae-Phyllanthoideae)

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KEY WORDS
Euphorbiaceae,
Phyllanthoideae,
Blotia,
Madagascar.

ABSTRACT
Revision of the genus *Blotia* Leandri (Euphorbiaceae-Phyllanthoideae) endemic to Madagascar. Five species are recognised, one new combination is made, two taxa are subsumed under *B. bemarensis*, and one name is excluded from the genus.

MOTS CLÉS
Euphorbiaceae,
Phyllanthoideae,
Blotia,
Madagascar.

RÉSUMÉ
Révision du genre *Blotia* Leandri (Euphorbiaceae-Phyllanthoideae) endémique de Madagascar. Cinq espèces sont reconnues, une nouvelle combinaison est établie, deux taxa sont mis en synonymie sous *B. bemarensis*, et un nom est exclu du genre.

INTRODUCTION

Blotia is a genus of five closely related species endemic to Madagascar. It belongs to the Euphorbiaceae-Phyllanthoideae and has been placed consistently in the tribe Wielandieae, which is often considered to be the basal tribe of the subfamily (WEBSTER 1994: 35). Within the Phyllanthoideae, *Blotia* is identified by the combination of persistent stipules, finely reticulate leaf venation, monoecy, presence of petals, partly fused filaments, sphaeroidal pollen grains and the lack of endosperm in the mature seeds as well as by its thin cotyledons, which are folded in a characteristic manner (Fig. 3E-F).

The plicate cotyledons led LEANDRI (1957: 240) to describe the genus, which he dedicated to Madame TARDIEU-BLOT, pteridologist at the Paris Museum. He included three species first described in *Savia* Willd. as well as two new species. Two of LEANDRI's species are here considered to be conspecific while *Blotia leandriana* Petra Hoffm. & McPherson (1996: 249) has been described in the course of our studies of the Euphorbiaceae-Phyllanthoideae of Madagascar. The poorly known *Petalodiscus mimosoides* (Baill.) Pax was found to be conspecific with *Blotia hildebrandtii* (Baill.) Leandri. As the former has the older basionym, the new combination *Blotia mimosoides* (Baill.) Petra Hoffm. & McPherson has to be made.

This study has been carried out using dried material only. The measurements of floral parts have been taken from softened flowers; all other characters were observed in a dry state. Good fertile material is needed for identification, as the differences between the species are rather subtle and most characters show considerable infraspecific variation.

BLOTIA Leandri

Mém. Inst. Sci. Madagascar, Sér. B, Biol. Vég. 8: 240 (1957); in Humbert, Fl. Madagascar 111(1): 126 (1958); Eg. Köhler, Grana Palynol. 6: 80 (1965); Levin, Syst. Bot. 11: 520-522 (1986); Mennega, J. Linn. Soc., Bot. 94: 114-115, 118 (1987); Greuter et al., Regnum Veg. 129: 136 (1993); G.L. Webster, Ann. Missouri Bot. Gard. 81: 36 (1994).

TYPE.—*Blotia oblongifolia* (Baill.) Leandri, Mém. Inst. Sci. Madagascar, Sér. B, Biol. Vég. 8: 240 (1957) [*Savia oblongifolia* Baill.].—Fig. 1.

Monoecious trees or shrubs with a weakly developed, simple indumentum. Leaves alternate, petiolate, simple, eglandular, blades symmetrical, entire, pinnately veined, elliptic, ovate or oblong, apex acuminate to acute (rarely obtuse), base acute to rounded, not decurrent. Anticlinal walls of the epidermal cells straight, stomata cyclocytic with 3-6 subsidiary cells. Petiolar vascular bundles compressed cylindrical throughout. Stipules persistent.

Inflorescences fasciculate, axillary, borne directly in the leaf axils or on short, unbranched, leafless axes, sometimes cauline, staminate and pistillate flowers together in the same fascicle. Flowers pedicellate, 5-merous (rarely 4- or 6-merous) except for the gynoecium. Bracts 3 per flower. Pedicel inarticulate. Sepals imbricate, quincuncial in 5-merous flowers. Petals 1/2-3 times as long as the sepals. Disc extrastaminal, annular, thick, more rarely thin, margin episepalously crenate to almost entire (very delicate and crenulate to lacerate in pistillate flowers of *B. mimosoides*). Stamens episepalous, filaments fused basally to various degrees, anthers introrse, longitudinally dehiscing. Pistillode clavate to cylindrical, 3(-4)-lobed. Ovary 3(-4)-locular, ovules 2 per locule, anatropous (funicle departing nucellus below apex), sharing a single 2-lobed obturator. Styles 3(-4), 2-lobed from the base. Stigmas acute to truncate.—Fig. 2.

Fruits capsular, mostly solitary (only one flower per fascicle seems to reach fruit maturity), subglobose to globose, 3(-4)-lobed, dehiscence septicidal, loculicidal and septifragal, dehiscence of septa irregular. Columella persistent, 6-10 times longer than the narrowest width, acutely 3-angled in cross section, base and apex only slightly thickened, disc and perianth persistent in the fruiting stage.—Fig. 3A-B.

Seeds 1-2 per locule, ecarunculate, shortly apiculate, with a ± distinct perichalazal annulus, globose to ovoid (1-seeded locules) or nearly triangular in cross section (2-seeded locules), smooth. Endosperm in mature seeds absent but

for a thin membrane, cotyledons thin, folded several times, radicle about three times longer than wide.—Fig. 3C-F.

Five species, distributed throughout Madagascar except for the dry south-western domain, not known from the Comoro Islands.

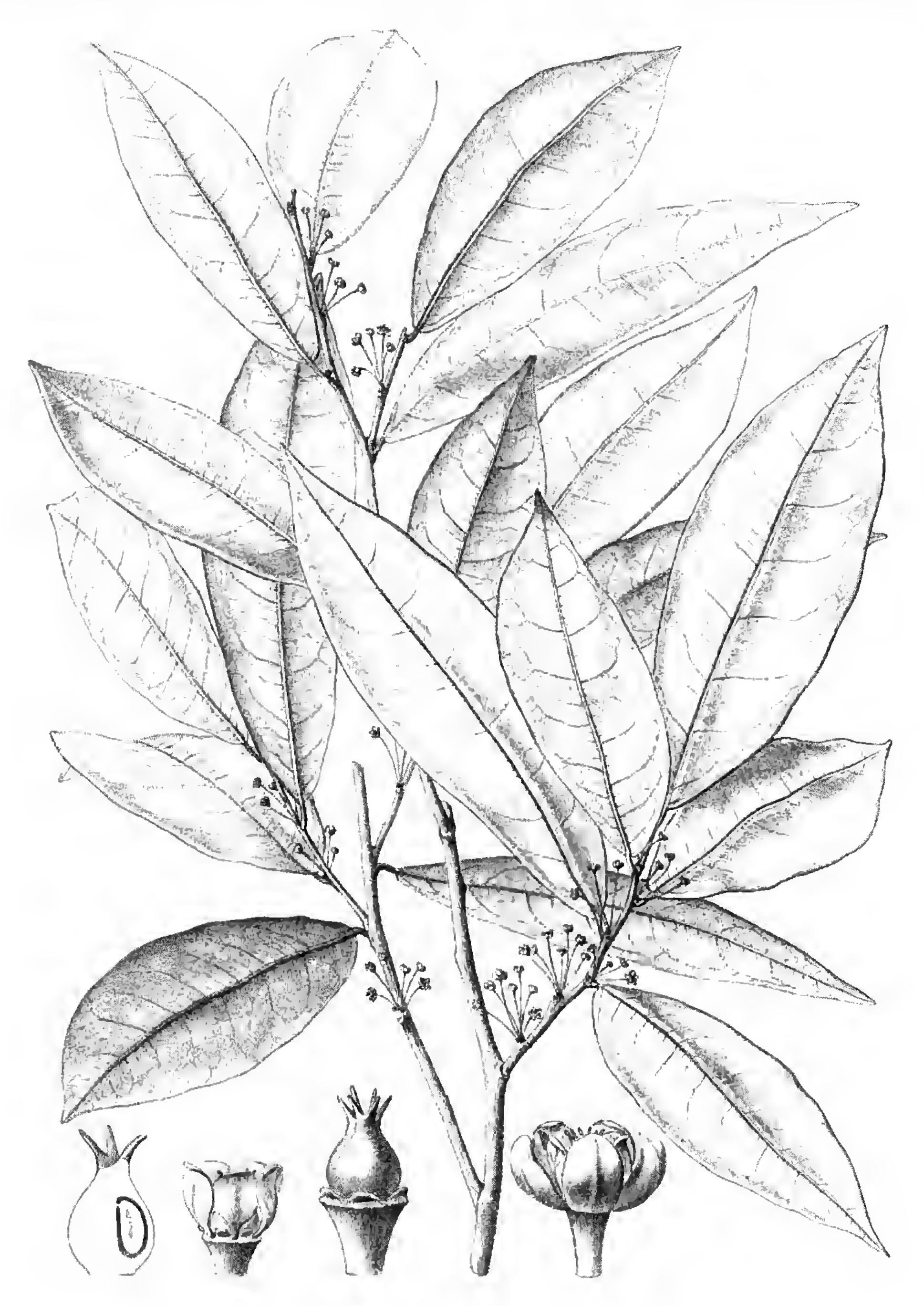


Fig. 1.—***Blotia oblongifolia***. Reproduced from BAILLON (1892, t. 208).

Key to the species

1. Sepals thickened and usually pubescent at tips; leaf blades (2.5-)4-9 cm long; petioles not canaliculate; flowers 3-6 mm long .... 5. **B. tanalorum**
1'. Sepals undifferentiated apically, glabrous; leaves and petioles various; flowers 1.5-3 mm long 2
2. Petioles 3-10 mm long, canaliculate; fruits 10-13 mm long .... 4. **B. oblongifolia**
2'. Petioles 1-3 mm long, canaliculate or not, fruits 6-9 mm long 3
3. Petals (1.5-)2-3 mm long, usually longer than the sepals at anthesis, clawed only at the base; leaf blades auriculate, ovate to elliptic .... 1. **B. bemarensis**
3'. Petals 1-1.5 mm long, as long as or shorter than the sepals at anthesis, clawed for about half the length; leaf blades auriculate or not, elliptic 4
4. Leaf blades auriculate, 1.5-3(-4) cm long; pedicels less than 15 mm long; petals 1 mm long .... 3. **B. mimosoides**
4'. Leaf blades not or scarcely auriculate, 2-6(-8) cm long; pedicels 10-20 mm long; petals 1-1.5 mm long .... 2. **B. leandriana**

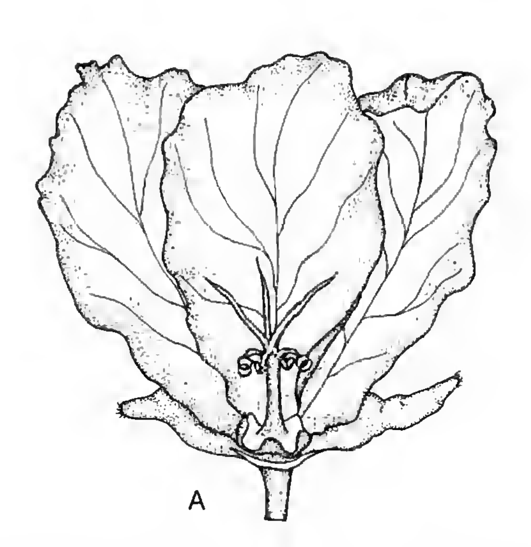
1. **Blotia bemarensis** (Leandri) Leandri

Mém. Inst. Sci. Madagascar, Sér. B, Biol. Vég. 8: 242 (1957); in Humbert, Fl. Madagascar 111(1): 130 (1958); Muller et al., Trop. Subtrop. Pflanzenwelt 67: 84 (1989).—*Savia bemarensis* Leandri, Bull. Soc. Bot. France 81: 588 (1934); Bull. Soc. Bot. France 84: 65 (1937); Notul. Syst. (Paris) 7: 189 (1939).—Type: *Leandri 938*, Madagascar, Tsingy du Bemaraha (9e Réserve), Anjohivazimba, 150-200 m (holo-, P!) There are specimens numbered *938bis* in BM, P and S.

Blotia ankaranae Leandri, Mém. Inst. Sci. Madagascar, Sér. B, Biol. Vég. 8: 242 (1957); in Humbert, Fl. Madagascar 111(1): 128 (1958); Eg. Köhler, Grana Palynol. 6: 50, t. 6, Fig. 4-6 (1965).—Type: *Service des Eaux et Forêts 9383*, Madagascar, Ankara de Diego-Suarez (holo-, P!); *syn. nov.*

Blotia ankaranae Leandri var. *sambiranensis* Leandri, Mém. Inst. Sci. Madagascar, Sér. B, Biol. Vég. 8: 243 (1957); in Humbert, Fl. Madagascar 111(1): 130 (1958).—Type: *Humbert 18642*, Madagascar, Bassin supérieur du Sambirano, 1700 m (lecto-, P!, chosen here; isolecto-, K!, P!); *syn. nov.*

Both species and variety were separated from *B. bemarensis* on the basis of leaf size, a feature that additional collecting has shown to vary widely within *B. bemarensis*.



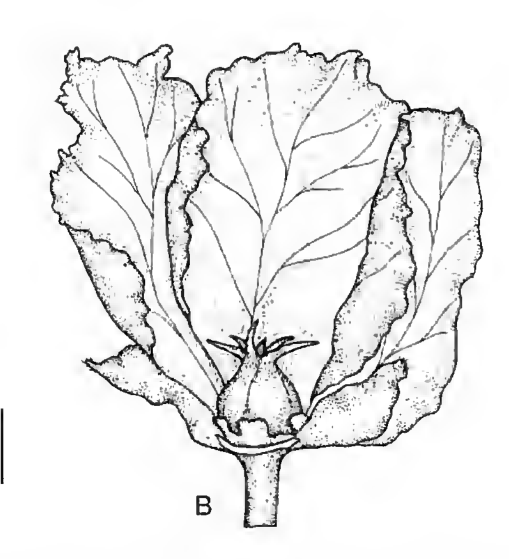


Fig. 2.—Flowers of ***Blotia tanalorum***, perianth partly removed: **A**, staminate flower; **B**, pistillate flower. *Rakoto 8929-RN* (P). Scale bar = 1 mm.

Shrub or small tree, 2-10 m tall. Young twigs terete, glabrous or patulously hairy. Leaves ovate, rarely elliptic, apex acuminate to caudate, base rounded or more rarely obtuse to acute, margins sometimes attenuate, auriculate, 2-5(-7) cm long, 1-2.5 cm wide, glabrous, coriaceous to chartaceous, green, greyish green, olive-green or yellowish, dull to shiny, midvein prominent on both sides, secondary venation not conspicuous compared with finer venation, finer venation less prominent above, more prominent beneath. Leaves often involute like the stipules when dry. Petiole terete, rarely slightly canaliculate, 1-2 mm long, 0.5-0.8 mm wide, glabrous or patulously hairy. Stipules narrowly deltoid to linear, acute, 2-4 mm long, 0.5-1 mm wide, ± ciliate, otherwise glabrous, light to dark brown when dry, often involute.

Inflorescences axillary and cauline on the same plant, staminate and pistillate flowers together in fascicles of ca. 2-30, borne directly in the leaf axils and/or on unbranched, leafless axes up to 1 cm long. Flowers pink and white to greenish.

Staminate flowers 2.5-3 mm long, ca. 4 mm wide. Bracts deltoid, acute, ca. 1 mm long, ca. 0.5 mm wide, glabrous or ciliate and hairy beneath. Buds globose, obtuse. Pedicel terete to flat, (5) 15-30 mm long, 0.2-0.3 mm wide, glabrous. Sepals 5, ovate to oblong, obtuse to rounded, 1.5-2.5 mm long, 1-1.5 mm wide, erose, mostly delicate, with a ± hyaline margin, not thickened apically, glabrous. Petals 5, oblong to rhombic, rounded to acute, clawed only at the base, slightly erose, delicate and sometimes stuck together (see under *B. tanalorum*), (1.5-)2-3 mm long, 1-2 mm wide, 1-2 times as long as the sepals, glabrous. Disc annular, margin episepalously crenate, 0.2-0.3 mm long, thick, glabrous. Stamens 5; 1-1.5 mm long, filaments fused at the base for 1/3 to 2/3 of their length, flat to terete, 1-1.5 mm long, their free part horizontally spreading, anthers nearly globose, 0.2-0.3 mm long, glabrous, base of anther cells usually separated by the expanded filament. Pistillode clavate to cylindrical, 1-3 times longer than wide, 0.5-0.7 mm long, 0.2-0.5 mm wide, 3-fid up to about the middle, branches semiorbicular to cylindrical, sometimes canaliculate adaxially, erect to slightly spreading, about as long as wide, glabrous.

Pistillate flowers ca. 3 mm long, ca. 4 mm wide. Bracts as in staminate flowers. Buds ellipsoid, obtuse. Pedicel terete, 5-25 mm long, 0.4-0.5 mm wide, slightly thickened distally, glabrous. Sepals 5, deltoid, ovate or oblong, acute, rarely rounded, 1.5-3 mm long, 1.5-2 mm wide, with a hyaline margin, glabrous. Petals 5, rhombic to elliptic, obtuse to rounded, clawed only at the base, slightly erose, robust to very delicate, (1.5-)2-3 mm long, 1.5-2 mm wide, 1-2 times as long as the sepals, glabrous. Disc as in staminate flowers. Ovary ovoid, ca. 1 mm long, glabrous. Styles 2-fid from the base or slightly less, their branches terete, ca. 0.5 mm long, ca. 0.2 mm wide, nearly straight, horizontally spreading, glabrous. Stigmas acute to truncate.

Fruits solitary, subglobose, 3-lobed, ca. 8 mm long, ca. 10 mm wide, glabrous, reticulate, medium to dark brown. Fruiting pedicels terete, up to 25 mm long, ca. 0.5 mm wide, glabrous. Columella 6-9 mm long, up to 1 mm wide in the middle, base scarcely thickened, apex thickened to 2 mm. Exocarp 0.1-0.3 mm thick, verrucate on inner surface. Endocarp 0.3-0.5 mm thick.

Seeds 5-6(-9) mm long, 5-6(-7) mm (1-seeded locules) or ca. 4 mm (2-seeded locules) wide, dull to slightly shiny, marbled, reddish brown.

DISTRIBUTION.—Northeastern Madagascar, dry zone, and transition to subhumid bioclimatic zone of CORNET 1974 (western floristic domain).

ECOLOGY.— Forest (forêts tropophiles, forêts ombrophiles), on limestone or sand; 100-1700 m.

VERNACULAR NAMES.—Koripity (*Rakotovao 5615-RN*); Morasira (*Zsiligy 2970-RN*); Tsiavango (*Ramaroson 7367-RN*).

ICONOGRAPHY.—LEANDRI, Mém. Inst. Sci. Madagascar, Sér. B, Biol. Vég. 8: 241, Fig. 7.12-14 (1957), habit, flower, embryo; LEANDRI in HUMBERT, Fl. Madagascar 111(1): 123, Fig. 20.9-10, habit; 127, Fig. 21.12-16 (1958), habit, flower, embryo, more elaborate version of the same drawings; Eg. Köhler, Grana Palynol. 6: t. 6, Fig. 4-6 (1965), pollen.

SPECIMENS EXAMINED.—MADAGASCAR: *Capuron 18349-SF*, Est, Environs de la Baie d'Antongil, massif

de Farankaraina, entre Navana et Andranofotsy, 9-150 m, 20 Sep. 1957 (K!, P!); *Capuron 18996-SF*, Ouest (Nord), Ankarana, au Nord-Est d'Ambondromifehy, causses et plateaux calcaires, 13 Nov. 1958 (K!, MO!, P!); *Capuron 20985-SF*, Ouest (Nord), Forêt du Sahafary, bassin de la Saharaina, 200 m, sables, 20 Feb. 1962 (K!, MO!, P!); *Capuron 22034-SF*, Ouest (Nord), Ankarana, près d'Ambondromifehy, 17 Nov. 1962 (K!, MO!, P!); *Capuron 22299-SF*, Est (sud), Forêt du Vinanibe, sur sables, près de Fort-Dauphin, 9 Jan. 1963 (P!); *Decary 15758*, Soalala, Namoroka, Reserve No. 8, 15 Sep. 1940 (MO!, P!); *Dokobe 10313-RN*, Antsalova, 11 Dec. 1958 (K!, MO!, P!); *Dorr et al. 3641*, Antananarivo, ca. 5 km NW of Ambohitsaratelo-Bebao (NW of Tsiroanomandidy), forest, overhanging stream, 24 Jan. 1985 (K!, MO!); *Du Puy et al. MB372*, NW Madagascar, prov. of Mahajanga, Mahajanga, BOINA region, ca. 15 km NW of the village of Vilanandro, Reserve National Integral of Nemoroka (sic!), ca. 140 m, limestone massif with pockets of basaltic soils, tsingy, 25 Sep. 1989 (K!, MO!, P!); *Humbert 18642*, Bassin supérieur du Sambirano, 1700 m, sol siliceux, forêt ombrophile, Nov.-Dec. 1937 (K!, MO!, P!), type of *B. ankaranae* var. *sambiranensis*; *Humbert 19196*, Diego-Suarez, Analamera, pentes de la rive droite de l'Analabe, affluent du Rodo, collines et plateaux calcaires, forêt tropophile, Jan. 1938 (MO!, P!); *Leandri 938*, Tsingy du Bemaraha, 9. Reserve, Anjohivazimba, 150-200 m, rochers calcaires, 17 Feb. 1933 (P!), type; *Leandri 938bis*, Tsingy du Bemaraha, 9. Reserve, Anjohivazimba, 150-200 m, rochers calcaires, 17 Feb. 1933 (BM!, P!, S!); *Leandri 382*, Tsingy du Bemaraha, 9. Réserve, rochers calcaires, Feb.-Apr. 1933 (K!, US!); *Leandri et al. 2049*, Antsingy, vers Ambodiriana (E. d'Antsalova), 100-150 m, calcaires, forêts à feuilles caduques, 7 Dec. 1952 (P!); *Meyers 247*, Antsiranana, Antsahalalina, part of Bobankora Range, 12 km E of Daraina, 205-607 m, 21 Jan. 1991 (K!); *Perrier de la Bâthie 111*, Ouest, Ambodiroka, près de Maevatanana, Nov. 1896 (P!); *Perrier de la Bâthie 841*, Ouest, Bois Fitingalava, rive droite de l'Ikopa entre Andriba et Maevatanana, Dec. 1898 (MO!, P!); *Perrier de la Bâthie 1243*, Ouest, Iabohazo, près du mont Tsitondroina, alluvions siliceux calcaires, forêts humides, Jan. 1902 (MO!, P!); *Perrier de la Bâthie 4568*, Ouest, Boïna (K!, P!); *Rakotovao 5615-RN*, Soalala, Canton Andranomavo, Reserve No. 8, pente, 23 July 1953 (P!); *Ramaroson 7367-RN*, Antsalova, Antsingy, 22 Sep. 1955 (K!, MO!, P!); *Randriamiera 72-RN*, Soalala, Canton Andranomavo, Ampidriabe, Vilanandro à 3 km, Anteradahy, forêt du Tsingy, 8 Oct. 1957 (MO!, P!); *Randrianasolo 2198-RN*, Soalala, Andranomavo, Namoroka, 23 Nov. 1950 (P!); *Service des Eaux et Forêts 9383-SF*, Diego-Suarez, Ankara, 11 Mar. 1954 (MO!, P!), type of *B. ankaranae*; *Service des Eaux et Forêts 12038-SF*, Diego-Suarez, Ankara-J.B. 8, 10 Nov. 1954 (MO!, P!); *Service des Eaux et Forêts 16570-SF*, Antsalova distr., canton et village, formation ripicole, dégradée, sol alluvionnaire, 9 Oct. 1956 (P!); *Zsiligy 2970-RN*, Soalala, Andranomavo, terrain flat (P!).

2. **Blotia leandriana** Petra Hoffm. & McPherson

Novon 7: 249 (1996).—Type: *McPherson & Dumetz 14651* (holo-, MO!; iso-, B!, DAV!, K!, P!, TAN!, TEF!).

Almost glabrous shrubs or small trees, up to 8 m tall. Young twigs terete, glabrous or with few short patulous hairs, shiny. Leaves elliptic, margin entire, leaf apex acuminate to acute, very apex rounded, leaf base acute, margins concave to convex, not auriculate, (2-)3-6(-8) cm long, 1-3 cm wide, glabrous, coriaceous or rarely chartaceous, light greyish green when dry, dull, midvein prominent on both sides, secondary venation not conspicuous compared with finer venation, finer venation less prominent above, more prominent beneath. Petiole terete, not canaliculate, 1-3 mm long, 0.7-1 mm wide, glabrous. Stipules linear, acute, 3-4 mm long, 0.5-1 mm wide, glabrous, very thin, red to black when dry, usually persistent, but easily broken off.

Inflorescences axillary (but reported also to be cauline), staminate and pistillate flowers together in fascicles of 5-20, borne directly in the leaf axils or on unbranched, usually leafless axes up to 1 cm long.

Staminate flowers ca. 2 mm long, 2-2.5 mm wide. Bracts deltoid, acute, ca. 0.5 mm long, ca. 0.5 mm wide, glabrous but ciliate. Buds globose. Pedicel terete, 10-15 mm long, ca. 0.2 mm wide, glabrous. Sepals 5, oblong to obovate, apex rounded, not thickened, 1.5-2 mm long, 1-1.2 mm wide, entire, glabrous, thick. Petals 5, spathulate, rounded, 1.2-1.5 mm long, 0.7-1 mm wide, as long as the sepals, often reflexed, clawed for about half the length, erose. Disc episepalously lobed, lobes separate or connate at the base, 0.2-0.3 mm long, thick, glabrous. Stamens 5; ca. 1 mm long, filaments fused at the base for 1/3 to 1/2 of their length, their free parts erect. Pistillode clavate to cylindrical, ca. 0.5 mm long, 0.2-0.3 mm wide, apex 3-lobed, lobes erect,

cylindrical to almost semiglobose, sometimes canaliculate adaxially, glabrous.

Pistillate flowers ca. 2 mm long, 2-3 mm wide. Bracts and buds as in staminate flowers. Pedicel terete, 10-20 mm long, ca. 0.3 mm wide, glabrous. Sepals 5, oblong to obovate, apex rounded, not thickened, ca. 1.5 mm long, 1-1.5 mm wide, entire, glabrous. Petals 5, spathulate, rounded, 1-1.2 mm long, 0.7-1 mm wide, slightly shorter than the sepals, often reflexed, clawed for about half the length, erose. Disc annular, episepalously lobed, margin erose, ca. 0.2 mm long, glabrous, thick. Ovary globose, ca. 1 mm long, glabrous. Styles 3, 2-fid to the base, their branches terete, ca. 0.3 mm long, ca. 0.1 mm wide, spreading, glabrous. Stigmas acute to truncate.

Fruits solitary or in twos, subglobose, 3-lobed, 6-8 mm long, 6-10 mm wide, glabrous, reticulate, light brown. Fruiting pedicels terete, (6-)10-25 mm long, 0.3-0.5 mm wide, glabrous. Columella 5-6 mm long, base and apex ca. 1 mm wide, thinner in the middle. Exocarp ca. 0.2 mm thick, reticulate on inner surface. Endocarp ca. 0.4 mm thick.

Seeds 1-2 per locule, ca. 7 mm long, 4-5 mm (1-seeded locules) or ca. 3 mm (2-seeded locules) wide, slightly shiny, light brown.

DISTRIBUTION.—Eastern Madagascar, humid bioclimatic zone (CORNET 1974).

ECOLOGY.—Eastern coastal forest, on sand and laterite; 10-1171 m.

VERNACULAR NAMES.—Zamalotra (*Rakotoniaina 2632-RN*).

ICONOGRAPHY: HOFFMANN & MCPHERSON, Novon 7: 250, Fig. 1A-D (1997), habit, leaf, flowers.

SPECIMENS EXAMINED.—MADAGASCAR: *Andrianarisata 109*, Toamasina, Réserve Naturelle Intégrale de Betampona, piste principale, 210-410 m, 22 Apr. 1994 (P!); *Badré 2074*, Antsiranana, 32 km au sud de Vohemar, à l'ouest de la route, 50-150 m, forêt, 26 Sep. 1988 (P!); *Capuron 24886-SF*, Est (Nord), environs Sud d'Antsirabe-Nord, sur la nouvelle route Vohémar-Sambava, 18 et 21 Oct. 1966 (P!); *Dumetz 1241*, Toliara, Prefecture de Tolanaro (Fort Dauphin), forêt dite Lakandava, 200 m, 25 Jan. 1990 (K!, MO, P!, TAN, TEF); *Dumetz & McPherson 1136*, Distr. Ft. Dauphin, Mandena Campement, 7 Dec. 1989 (MO!, P!, TAN, TEF); *McPherson 14407*, Toliara, Tolanaro (Ft. Dauphin) region, ca. 117 km N of city, ca. 7 km N of Mananenina, forest remnant called Analalava, laterite, 8 Nov. 1989 (MO!, P!, TAN, TEF); *McPherson et al. 14158*, Toliara, N of Ft. Dauphin (Tolanaro), St. Luce region, Manofiafy, 25 m, sand, coastal forest, 19 Oct. 1989 (MO!, P!, TAN!, TEF!); *McPherson et al. 14170*, Toliara, Tolanaro (N of Ft. Dauphin), St. Luce region (Manofiafy), 25 m, sand, coastal forest, 19 Oct. 1989 (MO!, P!, TAN, TEF); *McPherson & Dumetz 14651*, Toliara, Tolanaro (Ft. Dauphin), NE of town in coastal forest called Mandena, roadside forest E and beyond QIT camp, 25 m, 7 Dec. 1989 (B, DAV, K, MO!, P!, TAN, TEF), type; *Rabevohitra 1898*, Toliara, Prefecture de Tolanaro (Ft. Dauphin), Mandena (QIT-Fer), parcelle 4, 18 Apr. 1989 (MO!, P!, TAN, TEF); *Rabevohitra 2125*, Toliara, Préfecture de Tolanaro (Fort Dauphin), Mandena, 10 m, 13 Jan. 1990 (K!, MO!, P!, TAN, TEF); *Rajeriarison Euph 34*, Mandena (P!); *Rakotoniaina 2632-RN*, Tamatave, R.N. 1, 27 July 1950 (P!); *Rasoavimbahoaka 472*, Antsiranana, Marojejy RN1, Analamboahangy, Andrakata, Andapa, aux environs de Manenobasy, 14.35s 49.41e, 1171 m, forêt dense humide, 18-24 Jan. 1995 (P!); *Service des Eaux et Forêts 13918-SF*, Farafangana, Amporoforo, 26 July 1955 (P!); *Service des Eaux et Forêts 16270-SF*, Farafangana, J.B. No. 16, Manombo, Canton Ihorombé, latéritique avec concrétions, forêt côtière orientale (P!).

3. **Blotia mimosoides** (Baill.) Petra Hoffm. & McPherson, **comb. nov.**

Savia mimosoides Baill., Adansonia 2: 34 (1861); Étude Euphorb.: 573 (1858), nom. nud.; Müll. Arg. in DC., Prodr. 15(2): 230 (1866); Pax & K. Hoffm. in Engl., Pflanzenr., H. 81: 187 (1922); Leandri, Bull. Soc. Bot. France 84: 64 (1937); Notul. Syst. (Paris) 7: 190 (1939); Mém. Inst. Sci. Madagascar, Sér. B, Biol. Vég. 8: 239 (1957), key only; in Humbert, Fl. Madagascar 111(1): 126 (1958).—*Petalodiscus mimosoides* (Baill.) Pax in Engl. & Prantl, Nat. Pflanzenfam. 3(5): 15 (1890).—Type: *Du Petit-Thouars s.n.*, s.loc. (lecto-, P!, here designated).

Savia hildebrandtii Baill. in Grandid., Hist. phys. Madagascar, Atlas 2: t. 209 (1892); Pax & K. Hoffm. in Engl., Pflanzenr., H. 81: 186 (1922); Leandri, Bull. Soc. Bot. France 84: 64 (1937); Notul. Syst. (Paris) 7: 189 (1939).—*Blotia hildebrandtii* (Baill.) Leandri, Mém. Inst. Sci. Madagascar, Sér. B, Biol. Vég. 8: 242 (1957); in Humbert, Fl. Madagascar 111(1): 134 (1958); Eg. Köhler, Grana Palynol. 6: 50 (1965).—Type: Baillon in Grandidier, Hist. phys. Madagascar, Plantes 4 (Atlas 2): t. 209 (1892). The material used for this plate was probably *Hildebrandt 3931*; *syn. nov.*

Savia maroando Danguy ex Lecomte, Bois d'Analamazaotra: 71 (1922); Danguy, Notul. Syst. (Paris) 5: 1 (1935); Leandri, Bull. Soc. Bot. France 84: 64 (1937); Notul. Syst. (Paris) 7: 189 (1939); in Humbert, Fl. Madagascar 111(1): 128 (1958), per syn.—Type: *Thouvenot* (*coll. Ramanantsvolana*) *131*, Madagascar, Analamazaotra (lecto-, P!, chosen here; isolecto-, BM!, K!, P!, US!). Danguy (l.c.: 1, 1935) cited this collection as *Ramanantsvolana, Thouvenot & Fauchère 131*, but only the specimens in P bear all three collector's names, those in BM and US only that of *Thouvenot* and the one in K no collector's name at all.

Shrub or tree, 2-20 m tall. Young twigs terete, patulously hairy. Leaves elliptic, apex acute, rarely acuminate or obtuse, base acute, cuneate to attenuate, (0.5-)1.5-3(-4) cm long, 0.3-1.5 cm wide, glabrous, coriaceous or slightly chartaceous, light green to olive-green, dull to slightly shiny, midvein prominent on both sides, secondary venation usually not conspicuous compared with finer venation, finer venation scarcely prominent above, prominent beneath. Petiole ± canaliculate, 0.5-2 mm long, 0.6-0.7 mm wide, glabrous or patulously pilose. Stipules narrowly deltoid to linear, acute, 2-4 mm long, 0.5-1 mm wide, ± ciliate, otherwise glabrous, light brown to olive-green when dry.

Inflorescences axillary, flowers in fascicles of 3-12, borne directly in the leaf axils and/or on unbranched, leafless (sometimes some extremely reduced leaves present) axes up to 2 cm long; staminate and pistillate flowers together in the same inflorescence.

Staminate flowers 1.5-2.5 mm long, 2-4 mm wide. Bracts deltoid, acute, ca. 1 mm long, ca. 0.5 mm wide, glabrous or ciliate and hairy beneath. Buds globose, obtuse. Pedicel terete, 3-12 mm long, 0.2-0.3 mm wide, glabrous. Sepals 5-6, oblong to linear, rounded to obtuse, ca. 2 mm long, ca. 1 mm wide, with a slightly hyaline margin, sometimes ciliate, otherwise glabrous. Petals 5-6, spathulate to rhombic, rounded to obtuse, clawed for about half the length, erose, ca. 1 mm long, 0.5-1 mm wide, 1/2 to 2/3 as long as the sepals, glabrous, often reflexed; sometimes reduced to subulate processes. Disc annular, margin slightly episepalously crenate, undulate or nearly entire, ca. 0.2 mm long, thick, glabrous. Stamens 5; 0.5-1 mm long, filaments fused at the base for up to 1/3 of rheir length, terete, 0.8-1 mm long, anthers nearly globose, 0.3-0.4 mm long, glabrous. Pistillode clavate, not more than twice as long as wide, 0.5-0.7 mm long, ca. 0.5 mm wide, 3-fid for about half of its length, branches massive, rounded apically, canaliculate adaxially, erect, glabrous.

Pistillate flowers 1.5-2.5 mm long, 2-4 mm wide. Bracts as in staminate flowers. Buds globose to ellipsoid, obtuse. Pedicel terete, 3-12 (-15) mm long, ca. 0.3 mm wide, thickened distally, glabrous. Sepals 5-6, oblong to linear, rounded to obtuse, ca. 2 mm long, 0.5-1 mm wide, sometimes with a slightly hyaline margin, slightly ciliate, otherwise glabrous. Petals as in staminate flowers. Disc annular, margin irregularly crenulate to lacerate, sometimes lacerate to the base, up to 0.5 mm long, delicate, glabrous. Ovary ovoid, ca. 1 mm long, glabrous. Styles 2-fid to the base or slightly less, their branches terete, ca. 0.7 mm long, ca. 0.2 mm wide, recurved, glabrous. Stigmas obtuse to truncate, revolute.

Fruits solitary or up to 3 per inflorescence, subglobose, 3-lobed, rarely (in 4-carpellate fruits) 4-lobed, 7-9 mm long, 10-12 mm wide, glabrous, reticulate, medium to dark brown. Fruiting pedicels terete, 5-12(-20) mm long, 0.3-0.7 mm wide, glabrous. Columella 6-7 mm long, up to 1 mm wide in the middle, base not thickened, apex thickened to 1.5 mm. Exocarp ca. 0.1 mm thick, reticulate on inner surface. Endocarp ca. 0.3 mm thick.

Seeds 6-7 mm long, 6-7 mm (1-seeded locules) or 4-5 mm (2-seeded locules) wide, dull to slightly shiny, marbled, reddish brown.

NOTES.—Although there can be no doubt about the conspecifity of *Petalodiscus mimosoides* and *Blotia hildebrandtii*, both BAILLON and LEANDRI stated in their descriptions of *Savia mimosoides* that the sepals and petals are of equal length, while they considered the petals of *B. hildebrandtii* to be only half as long as the sepals. In fact, petals of a softened flower of the type of *P. mimosoides* are only 2/3 as long as the sepals, and hence fall within the variation of *B. hildebrandtii*.

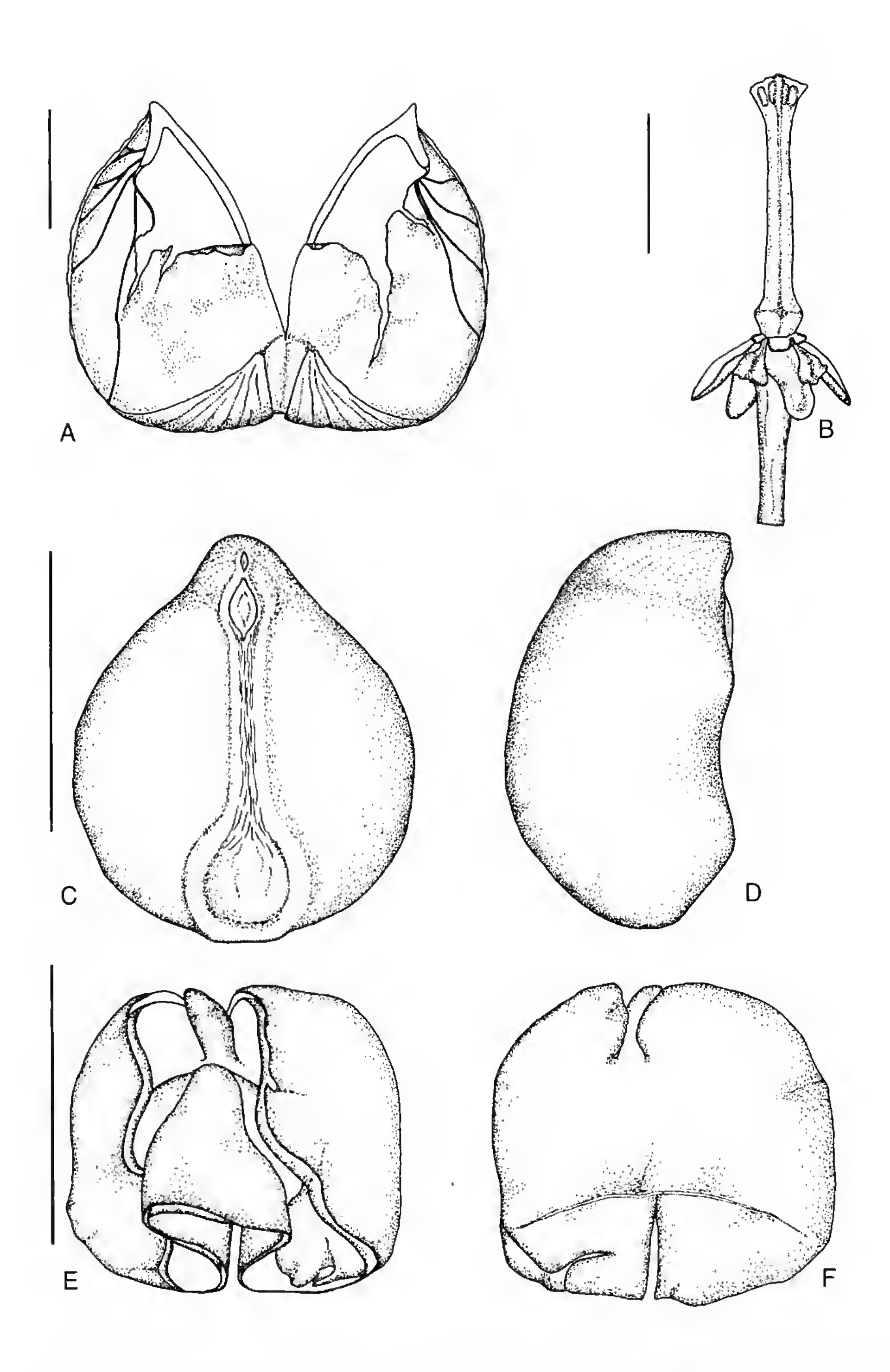


Fig. 3.—Fruit, seed and embryo of ***Blotia***. A-D, ***B. oblongifolia***: **A**, mericarp; **B**, columella with persistent perianth and aborted ovules; **C**, ventral view of seed with moderately developed perichalazal annulus; **D**, lateral view of seed. E-F, ***B. mimosoides***, embryo from a 1-seeded locule: **E**, ventral view; **F**, dorsal view. A-B, *Service des Eaux et Forêts 6157-SF* (P), C-D *Capuron 8220-SF* (P); E-F *Baron 71* (P). Scale bar = 5 mm.

Besides *B. mimosoides*, the type sheet bears two sterile branches of one or two other taxa. For this reason, a lectotype excluding the two leftmost branches is here designated according to Art. 9.9 of the Tokyo Code.

DISTRIBUTION.—Madagascar, humid and subhumid bioclimatic zones of CORNET 1974 (eastern and central floristic domain). LEANDRI's observation (1958: 126) that this species seems to have been introduced to the Mascarenes is based upon a misidentification.

ECOLOGY.—Shady and dry forests; 350-1869 m.

VERNACULAR NAMES.—Beando (*Raberson 97-R-140*); Biandomadinidravina (*Rabarimalala 2544*), Fanazava (*Capuron 18053-SF*), Fanjavala (*SF 1026, SF 1088, SF 1758, SF 1770, SF 3939, SF 6010, s.coll. 16-R-254, 21-R-304, 40-R-60, 49-R-497*; LEANDRI 1958: 135), Fanjavalahy (*SF 19016*), Fanjavoala (*SF 13006*; LEANDRI 1958: 135), Fotsinanaharey (*SF 1088*); Hazomfiasika (*SF 25877*), Hitsika (*Rabobisoa 9-R-274*), Karakaratiloho (*Rabarimalala 2382*), Mampay à grandes feuilles (*s.coll. 38-R-195*); Maroando (*Perrier de la Bâthie 9648, SF 26166, s.coll. 84-R-72*; LECOMTE 1922: 71, LEANDRI 1958: 135), Menahy (*s.coll. 178-R-77*), Voandavenona (*SF 4048*; LEANDRI 1958: 135), Voatonakala (*SF 3574*; LEANDRI 1958: 135), Voretra (*SF 1715*).

ICONOGRAPHY.—BAILL. in GRANDID., Hist. Phys. Madagascar, Atlas 2: t. 209 (1892), habit, flower; LEANDRI in HUMBERT, Fl. Madagascar 111(1): 117, Fig. 19.9-11 (1958) flowering branch, diagram of pistillate flower, and 123, Fig. 20.12-14 (1958), flower.

SPECIMENS EXAMINED.—MADAGASCAR: *Baron 71*, Chiefly in Betsileo-land [Sud Betsileo, bois d'Ankafina, fide LEANDRI 1958], recd. at K: July 1880, purch. by P: 1889 (K!, P!); *Campenon s.n.*, s.loc., reçu le 20 Nov. 1889 (P!); *Capuron 11962-SF*, Forêt d'Ankaratra, versant Est du massif de l'Ankaratra, Apr. 1955 (K!, MO!, P!); *Capuron 18053-SF*, Centre-Est, Périnet, Analamazaotra, forêt, 30 July 1957 (K!, MO!, P!); *Capuron 18141-SF*, Est, Mahambo, au sud de Fénérive, sables, forêt sublittorale, 30 Aug. 1957 (K!, MO!, P!); *Capuron 18171-SF*, Est, au Nord du lac de Tampolo (Fénérive), sables, forêt sublittorale, 31 Aug. 1957 (K!, MO!, P!); *Capuron 18511-SF*, Est, Tsinjoarivo, à l'Est d'Ambatolampy, 30 Mar. 1958 (K!, P!); *Capuron 23782-SF*, Est, près d'Ambatoharanana (entre les embouchures de la Manambato et de l'Onive), sable, forêts littorales et sublittorales, 15 Nov. 1964 (K!, MO!, P!); *Capuron 23859-SF*, Centre, Massif du Vohibe-Antoetra, au S-SE d'Ambositra, 1600-1869 m, 1 Dec. 1964 (K!, MO!, P!); *Cours 4716*, Didy à Brickaville, forêt orientale, reçu 1954 (K!, MO!, P!); *Cours 4872*, Didy à Brickaville, forêt orientale, reçu 1954 (P!); *Dorr et al. 3221*, Tamatave, Environs d'Andasibe-Périnet, higher areas with *Weinmannia*, *Tambourissa*, low, moist areas with *Ficus*, 2-5 Nov. 1984 (K!, MO!, P!); *Du Petit-Thouars s.n.*, s.loc. (P!), type; *Geay 9062*, Tamatave, Distr. Fénérive, zone côtière, bois au S de l'Azafo (Azofo), 1909 (P!); *Geay 9063*, idem (P!); *Gouvernement de Madagascar 38*, Analamazaotra, 8 Dec. 1908 (MO!, P!), syntype of *Savia maroando*; *Herb. d'Alleizette 1306*, Côte Est, S de Tamatave, Nov. 1906 (P!); *Herb. d'Alleizette s.n.* (5?), Est, forêt de l'Analamazaotra, Oct. 1905 (P!); *Hildebrandt 3931*, Süd-Betsileo, Wald von Ankafina, Feb. 1881 (A!, BM!, G!, M!, P!); *Jacquemin 1189*, Ft. Dauphin, forêt d'Esetra entre la scierie et la R.N. 12a, bord de ruisseau, 11 Dec. 1972 (P!); *Jacquemin H216J*, Tamatave, Piste de Fotsialanana à Ampasiventy, 23 Oct. 1966 (P!); *McPherson 14419*, Toliara, 117 km N of Fort Dauphin and 7 km N of Manantenina, 50 m, 8 Nov. 1989 (MO!); *Perrier de la Bâthie 9620*, Est, forêt d'Analamazaotra, 800 m (K!, P!); *Perrier de la Bâthie 9648*, Est/Centre, Analamazaotra, 800 m, forêt (MO!, P!); *Perrier de la Bâthie 17209*, Centre, bois Tsinjoarivo, 1400 m, Feb. 1925 (P!); *Rabarimalala 2382*, Saharamy de Verezanantsoro, Fir. Mananara Nord, 350 m, forêt ombrophile, 14 Oct. 1990 (P!); *Rabarimalala 2544*, forêt de Varary, au sommet d'une colline au SW du village, forêt entourée de Savoka à "Longoza", 6 Nov. 1990 (P!); *Rakoto 338*, Fianarantsoa, Ranomafana, Parcelle II, 21°16'S, 47°21'E, 1080-1150 m, 24 Nov. 1992 (MO!, P!); *Rakotomalaza et al. 699*, Fianarantsoa, forêt d'Ambalahambana, 1770 m, 29 Mar. 1996 (MO!); *Rabobisoa 9-R-274*, Tamatave, forêt Manoandrivotra, Antetazambaro, 29 Sep. 1954 (P!); *Roberson 97-R-140*, Antalaha, canton Ampanavoana, forêt du Ankalampona, 22 Apr. 1951 (P!); *Service des Eaux et Forêts 1026-SF*, Tsinjoarivo, Ambatotsipihina, bord ruisseau, 19 Dec. 1949 (P!); *Service des Eaux et Forêts 1088-SF*, Périnet, Sahamamy, 10 Jan. 1950 (P!); *Service des Eaux et Forêts 1715-SF*, Ambatondrazaka (P!); *Service des Eaux et Forêts 1758-SF*, Angodona, Tsinjoarivo, 5 June 1950 (P!); *Service des Eaux et Forêts 1770-SF*, Tsinjoarivo, Angodona, 5 June 1950 (P!); *Service des Eaux et Forêts 3574-SF*, Tamatave, Antanerilava, Res. Nat. No. 1, 12 June 1951 (P!); *Service des Eaux et Forêts 3939-SF*, Tsinjoarivo, Antandrokomby, 20 July 1951 (P!); *Service des Eaux et Forêts 4048-SF*, Est, entre Ambatondrazaka et

Befody, forêt de l'Est, 29 Aug. 1951 (P!); *Service des Eaux et Forêts 6010-SF*, Tsinjoarivo, Ambatolampy, 2 July 1952 (P!); *Service des Eaux et Forêts 13006-SF*, forêt Ambomitsara, Anjamanga, Ambatolampy, 16 Dec. 1954 (P!); *Service des Eaux et Forêts 19016-SF*, Moramanga, canton Périnet, Analamazaotra, 800 m, latéritique, forêt dense humide, 23 Apr. 1958 (P!); *Service des Eaux et Forêts 25877-SF*, Moramanga, Solafana, Teoby P.K. 24 route d'Anosibe, 900 m, latéro-humifère, forêt sèche, 16 Nov. 1965 (MO!, P!); *Service des Eaux et Forêts 26166-SF*, Mangabe, Ampasimaventy, Andranomanapika, latéritique très couvert d'humus, 23 Oct. 1966 (MO!, P!); *Thouvenot (coll. Ramanantsoavolana) 131*, Analamazaotra, 8 Feb. 1920 (BM!, K!, P!, US!), type of *Savia maroandro*; *s.coll. 3-R-179*, Ananalava, Ambohimahasoa, 23 Dec. 1951 (P!); *s.coll. 16-R-254*, Ambositra, canton Ivato, forêt Lehimena, 19 Apr. 1953 (P!); *s.coll. 21-R-304*, Ambatolampy, canton Tsinjoarivo, forêt de Tsinjoarivo, Ambohikambana village, flanc de colline, terrain sableux (P!); *s.coll. 38-R-195*, Tamatave, canton Ambodilazana, forêt de Sahasy, sommet de colline, sol argile, 8 Mar. 1956 (P!); *s.coll. 84-R-72*, Distr. Fénerive, Ambahoabe, Poste de Soanierana-Ivongo (P!); *s.coll. 84-R-107*, Antevialambazaha, Mananara, 16 Dec. 1951 (P!); *s.coll. 40-R-60*, canton and district Ambositra, forêt d'Ivanana, 8 Mar. 1952 (P!); *s.coll. 178-R-77*, Menagisy, Brickaville, 7 Apr. 1954 (P!).

4. **Blotia oblongifolia** (Baill.) Leandri

Mém. Inst. Sci. Madagascar, Sér. B, Biol. Vég. 8: 240 (1957); in Humbert, Fl. Madagascar 111(1): 132 (1958); Punt, Wentia 7: 34 (1962) pollen; Levin, Ann. Missouri Bot. Gard. 73: 40, 41 (1986); Muller et al., Trop. Subtrop. Pflanzenwelt 67: 84 (1989).—*Savia oblongifolia* Baill., Adansonia 2: 35 (1861); Müll.Arg. in DC., Prodr. 15(2): 229 (1866); Pax & K. Hoffm. in Engl., Pflanzenr., H. 81: 187 (1922); Lecomte, Bois d'Analamazaotra: 71 (1922); Leandri, Bull. Soc. Bot. France 84: 64 (1937); Notul. Syst. (Paris) 7: 190 (1939).—*Wielandia oblongifolia* Baill., Étude Euphorb.: 569 (1858), nom. nud.—*Petalodiscus oblongifolius* (Baill.) Pax in Engl. & Prantl., Nat. Pflanzenfam. 3(5): 15 (1890), «*oblongifolia*».—Type: *Boivin 1886*?, Madagascar, Ste.-Marie de Madagascar, forêt de Tafondrou (lecto-, P!, chosen here; isolecto-, P!).

Savia decaryi Leandri, Bull. Soc. Bot. France 81: 589 (1934); Notul. Syst. (Paris) 7: 190 (1939), per syn.—*Savia oblongifolia* Baill. var. *decaryi* Leandri, l.c., "per sp.".—Type: *Decary 6389*, Madagascar, Ambila, au sud de Tamatave (lecto-, P!, chosen here; isolecto-, K!, US!).

Tree or shrub, 2-20 m tall. Young twigs terete, glabrous. Leaves persistent, oblong to elliptic, rarely slightly ovate, apex acuminate to acute, base acute to obtuse, rarely rounded, rarely slightly auriculate, (4-)6-14(-30) cm long, 1.5-4.5(-7) cm wide, glabrous, coriaceous, light green to olive-green, shiny, rarely bullate, midvein prominent on both sides, secondary venation conspicuous compared with finer venation, finer venation scarcely prominent above, prominent beneath. Petiole canaliculate, 3-10 mm long, 1-1,5 mm wide, glabrous. Stipules narrowly deltoid to linear, acute, 3-7(-25) mm long, 0.5-1.5(-2.5) mm wide, glabrous, light brown to olive-green when dry, but mostly broken off.

Inflorescences axillary and cauline on the same plant, staminate and pistillate flowers together in fascicles of ca. 10-15, borne directly in the leaf axils or on unbranched, leafless axes less than 1 cm long. Flowers reddish.

Staminate flowers ca. 2 mm long, 3-4 mm wide. Bracts deltoid, acute, ca. 1 mm long, ca. 0.5 mm wide, glabrous or ciliate and hairy beneath. Buds globose, obtuse. Pedicel terete to flat, 7-22 mm long, 0.2-0.3 mm wide, glabrous. Sepals 5, linear to elliptic, rounded, more rarely obtuse to acute, ca. 2 mm long, 0.5-1 mm wide, with a slightly hyaline margin, apex rarely with some hairs, otherwise glabrous. Petals 5, spathulate to rhombic, rounded to obtuse, clawed for about half the length, erose, ca. 2 mm long, 0.7-1 mm wide, about as long as the sepals, glabrous, often reflexed. Disc annular, margin slightly episepalously crenate, undulate or nearly entire, ca. 0.2 mm long, thick, glabrous. Stamens 5; 1-1,5 mm long, filaments fused at the base for 1/3 to 1/2 of their length, terete, 0.8-1,3 mm long, anthers nearly globose, reflexed (ca. 90°), 0.2 mm long, glabrous, base of anther cells usually separated by the expanded filament. Pistillode clavate, not more than twice as long as wide, 0.5-0.7 mm long, 0.3-0.5 mm wide, 3-fid for half of its length, branches massive, rounded apically, canaliculate adaxially, erect, glabrous.

Pistillate flowers ca. 2 mm long, 3-4 mm wide. Bracts and buds as in staminate flowers. Pedicel terete to flat, 7-22 mm long, 0.3-0.5 mm wide, thickened distally, glabrous. Sepals 5, deltoid to oblong, rounded, rarely obtuse to acute, ca. 2 mm long, 1-1.5 mm wide, with a slightly hya-

line margin, glabrous. Petals and disc as in staminate flowers. Ovary ovoid, ca. 1 mm long, glabrous. Styles 2-fid to the base or slightly less, their branches terete, ca. 0.5 mm long, ca. 0.2 mm wide, nearly straight, erect to horizontally spreading, glabrous. Stigmas acute to truncate.

Fruits reddish, solitary or up to 3 per inflorescence, subglobose, 3-lobed, 10-13 mm long, 14-16 mm wide, glabrous, reticulate, medium to dark brown. Fruiting pedicels terete, 7-25(-30) mm long, ca. 0.7 mm wide, glabrous. Columella 7-11 mm long, ca. 1 mm wide in the middle, base scarcely thickened, apex thickened to 2 mm. Exocarp 0.2-0.3 mm thick, reticulate to verrucate on inner surface. Endocarp 0.7-1 mm thick.

Seeds 1-2 per locule on the same plant, ca. 7 mm long, ca. 7 mm (1-seeded locules) or 4-5 mm (2-seeded locules) wide, dull to slightly shiny, ± marbled, medium to reddish brown.

DISTRIBUTION.—Eastern Madagascar, humid and transition to subhumid bioclimatic zone (CORNET 1974).

ECOLOGY.— Humid and subhumid forests; 0-800 m.

VERNACULAR NAMES.—Faniavala (LEANDRI 1958: 133), Fanjavala *(Gouvernement de Madagascar 93, SF 1811, SF 3705, SF 3839, SF 6057, SF 10346, SF 10357, SF 12167)*, Fanzavala (*Perrier de la Bâthie 5286*), Fotsinanahary (*SF 4363, SF 26836*; LEANDRI 1958: 133), Haraharatoloho (*Raharimalala 2142*), Hazomena (*Rakotovao 8524*), Hazompantsika (Leandri 1958: 133), Hazompasika *(Gouvernement de Madagascar 20, Service de Colonisation* (*Randrianasolo coll.*) *53 = Thouvenot s.n.*, 1918; LECOMTE 1922: 71, LEANDRI 1958: 133), Hazondramoka (*Razanaparany 8225-RN, Razanaparany 8515-RN*); Hompamena (*SF 21431*), Kotrofotsy (LEANDRI 1958: 133), Maroandrano (*SF 13824*; LEANDRI 1958: 133), Menatoraka [dial. Taisaka] (*SF 16262*), Pitsikahitra (*Ratovoarison 21318-SF*), Tanatanampotsy (*SF 6157, Zafindraboto 199* (*69-SF*); LEANDRI 1958: 133).

ICONOGRAPHY.—BAILL. in GRANDID., Hist. phys. Madagascar, Atlas 2: t. 208 (1892), habit, flower; Levin, Ann. Missouri Bot. Gard. 73: 41: Fig. 5, 6 (1986), leaf venation; MULLER et al., Trop. Subtrop. Pflanzenwelt 67: 63, Fig. 7-15 (1989), pollen.

SPECIMENS EXAMINED.—MADAGASCAR: *Andrianarisata 173*, Toamasina, Réserve Naturelle Intégrale de Betampona, piste principale, piste Sahabefoza, piste Betakonana. 17°55'S, 49°13'E, 210-410 m. 29 Apr. 1994 (MO!, P!); *Andrianarisata et al. 227*, Toamasina, Réserve Naturelle Intégrale de Betampona, entre les points kilometriques 1 et 2, 300-400 m, 5 Oct. 1994 (MO!, P!); *Boivin 1886?*, forêt de Tafondrou, "Ste.-Marie de Mad.", 1849 (P!), type; *Capuron 822-SF*, Est, Vallée de l'Androranga (bassin de Bemarivo N.E.), flancs sud de Betsomanga, 690 m, 17 Nov. 1950 (K!, MO!, P!); *Capuron 18134-SF*, Est, Tamatave, Réserve Naturelle no. 1, Ambodiriana, 250-500 m, 23 Aug. 1957 (K!, P!); *Capuron 23638-SF*, Est, Farafangana, forêt de Manombo, au Sud de Farafangana, latérite de basalte, 17 Oct. 1964 (K!, MO!, P!); *Decary 6389*, Ambila, S de Tamatave, clairière de forêt littorale, 2 Feb, 1926 (K!, P!, US!), type of *Savia decaryi*; *Gouvernement de Madagascar 20*, s.loc. (P!); *Lewis et al. 824*, Fianarantsoa, Andringitra, ca. 45 km S of Ambalavao, 720 m, 15-21 Nov. 1993 (MO!); *Louvel* (*Herb. forestier de Madag.*) *93*, forêts montagneuses de l'Est (P!); *Lowry et al. 4490*, Toamasina, Ambanizana, on the Masoala Peninsula, ca. 30 km SE of Maroantsetra; trail leading from S of the village E into the mountains, 500 m, open area near a wind fall in dense, wet forest, 13 May 1988 (P!, MO!); *Perrier de la Bâthie 4472*, Est/Centre, Analamazaotra, 800 m, bois, Feb. 1913 (P!); *Perrier de la Bâthie 5286*, Est, forêt d'Analamazaotra, 800 m (K!, MO!, P!); *Rabajason et al. 824*, Antsiranana, Parc National de Masoala, Andrombazaha, 15°16' S, 50°29' E, 0 m, 10 Oct. 1994 (P!); *Raharimalala 2142*, Verezanantsoro, 570 m, forêt ombrophile, 8 Oct. 1990 (P!); *Rakotovao 8524*, Farafangana, canton Ivongo, 16 Dec. 1956 (P!); *Ratovoarison (R172) 32F = 21318-SF*, Moramanga, canton Périnet, Antsampandrano, forêt primaire sur la flanc, 9 Nov. 1962 (P!); *Service de Colonisation (coll. Randrianasolo) 53* [additional label: *Thouvenot s.n.*, 1918], Analamazaotra, 1918 (K!, P!); *Service des Eaux et Forêts 1811-SF*, Périnet, 7 Feb. 1950 (P!); *Service des Eaux et Forêts 3705-SF*, Périnet, Sahamaloto, 19 July 1951 (P!); *Service des Eaux et Forêts 3839-SF*, Périnet, Sahamaloto, 10 July 1951 (P!); *Service des Eaux et Forêts 4363-SF*, Périnet, Beravina, Antsahatsaka, 2 Aug. 1951 (P!); *Service des Eaux et Forêts 6057-SF*, Périnet, Sahamaloto, 18 Oct. 1952 (MO!, P!); *Service des Eaux et Forêts 6157-SF*, Jardin Botanique 17, Maroantsetra, 2 Oct. 1952 (K!, MO!, P!); *Service des Eaux et Forêts 10346-SF*, Périnet, 19 May 1954 (K!, P!); *Service des Eaux et Forêts 10357-SF*, Moramanga, Périnet, Sahamaloto, 29 Apr. 1954 (P!); *12167-SF*, Périnet, Sahamaloto, 21 Aug. 1954 (P!); *Service des*

Eaux et Forêts 13824-SF, Ifanadiana, forêt Ambatolahiambo, 8 Mar. 1955 (P!); *Service des Eaux et Forêts 16262-SF*, Farafangana, canton Evato, Amporoforo, forêt d'Analavory, latéritique, en lisière de forêt (P!); *21431-SF*, Fénerive, Tanamarina, Tsinjoarivo, 4 Oct. 1963 (P!); *26836-SF*, Moramanga, P.K. 27-28 route Moramanga-Anosibe, forêt sèche, 10 Jan. 1969 (K!, MO!, P!); *Thouvenot 5*, Analamazaotra, 1918 (A!, P!); *Ursch 10 (16?)*, Analamazaotra, 3 Dec. 1934 (P!); *Ursch 63*, idem (P!); *s.coll. 198-RN*, Fénerive, canton Ambodiampana, Ambahoabe (P!); *Razanaparany 8225-RN*, Tamatave, Ambodiriana, 2 Mar. 1956 (P!); *Razanaparany 8515-RN*, Tamatave, canton Ambodiriana, 19 Nov. 1956 (P!); *Zafindraboto 69-R-199*, Jardin Botanique de Maroantsetra (P!);

SPECIMENS WITH BULLATE LEAVES.—*Cours 1195* = *TAN 4344* = *O-299*, Distr. Ambatondrazaka, Lac Alaotra (A-299) (P!); *Jacquemin H568J*, Route Andapa-Doany-vallée de l'Andranotsara, 24 Oct. 1967 (P!); *Perrier de la Bâthie 2077*, Côte Est, environs baie d'Antongil, 500 m, bois, 1912 (P!).

SPECIMENS WITH EXCEPTIONALLY LONG LEAVES.—*Capuron 28070-SF*, Est, forêt d'Analalava, à l'Ouest de Foulpointe, sur latérites, 19 Dec. 1967 (K!, P!); *s.coll. 22-R-72*, Fénérive, Poste de Soanierana-Ivongo, Ambahoabe, Apr. 1950 (P!).

Capuron 28070-SF differs from all other *Blotia* collections in its larger (15-30 × 3-7 cm), narrowly ovate leaves with an acute to only very slightly acuminate apex and an auriculate base. The stipules are only ca. 5 × 1 mm in size. The (staminate) flowers are identical to those of *B. oblongifolia*. The specimen *s.coll. 22-R-72* is an intermediate between a typical *B. oblongifolia* and *Capuron 28070-SF*: leaves 12-20 × 3-5 cm, leaf base not auriculate and stipules large (20 × 2.5 mm). More material is needed to decide upon the status of these collections.

5. **Blotia tanalorum** Leandri

Mém. Inst. Sci. Madagascar, Sér. B, Biol. Vég. 8: 243 (1957); in Humbert, Fl. Madagascar 111(1): 131 (1958).—Type: *Decary 5104*, Madagascar, prov. Farafangana, Ivohibe, bord de chemin (lecto-, P!, chosen here; isolecto-, K!,).

Tree or shrub, 2-10 m tall. Young twigs terete, glabrous or patulously hairy. Leaves elliptic to oblong, rarely ovate, apex acuminate to acute, base acute, sometimes attenuate, ± auriculate, (2.5-)4-9(-12) cm long, (1.5-)2-3.5(-4.5) cm wide, glabrous, chartaceous, greyish to light green, dull, midvein prominent on both sides, secondary venation usually not conspicuous compared with finer venation, finer venation scarcely prominent above, prominent beneath. Petiole terete, not canaliculate, 2-4 mm long, 0.8-1.5 mm wide, glabrous or patulously hairy. Stipules narrowly deltoid to linear, acute, 3-4 mm long, ca. 1 mm wide, glabrous, light brown to olive-green when dry.

Inflorescences axillary and cauline on the same plant, staminate and pistillate flowers together in fascicles of ca. 5-30, borne directly in the leaf axils or more rarely on unbranched, leafless axes less than 1 cm long.

Staminate flowers 3-5 mm long, 4-6(-7) mm wide, very delicate. Bracts deltoid, acute, 1-1.5 mm long, 0.5-1 mm wide, glabrous. Buds ovoid to ellipsoid, acute. Pedicel terete, 10-20 mm long, 0.1-0.2 mm wide, glabrous. Sepals 5, rarely 4, deltoid to ovate, acute, 2-3 mm long, 1-2 mm wide, erose, apex thickened and with some hairs beneath, otherwise glabrous, membranaceous. Petals 5, rarely 4, nearly elliptic to spathulate, clawed only at the base, erose, 4-5 (-6) mm long, 2-3 mm wide, three times to only a little longer than the sepals, glabrous, membranaceous (LEANDRI 1957: 244; 1958: 128, 132) described the staminate petals as being fused at the base, but this observation could not be confirmed in the present study. However, the delicate perianth is usually compressed and completely stuck together when dry, so that the individual parts can hardly be separated from each other). Disc annular, margin crenate, undulate or nearly entire, lobes episepalous, rounded or retuse, 0.3-0.8 mm long, thin, glabrous. Stamens 5, rarely 4; 1.5-2 mm long, filaments fused at the base for at least 2/3 of their length, terete to flat, 1.3-1.8 mm long, anthers nearly globose, basi- to ventrifix, reflexed (90-180°), 0.2 mm long, glabrous, base of anther cells usually separated by the expanded filament. Pistillode cylindrical, more than three times longer than wide, 1-1.5 mm long, ca. 0.2-0.3 mm wide, 3, rarely 4-fid for half of its length, its branches subulate, sometimes 2-fid for half of their length, erect to horizontally spreading, glabrous.

Pistillate flowers 3-6 mm long, 4-6 mm wide, delicate. Bracts and buds as in staminate flowers. Pedicel terete, 5-25 mm long, 0.2-0.3 mm wide,

glabrous or patulously hairy. Sepals, petals and disc as in staminate flowers. Ovary globose to ovoid, 0.5-1 mm long, glabrous. Styles 2-fid to the base or slightly less, their branches terete, ca. 0.5 mm long, 0.1-0.2 mm wide, nearly straight, erect to horizontally spreading, glabrous. Stigmas acute to truncate.

Fruits solitary, nearly globose, 3-lobed, 8-9 mm long, 8-9 mm wide, glabrous, reticulate, medium to light brown. Fruiting pedicels terete, 9-15 mm

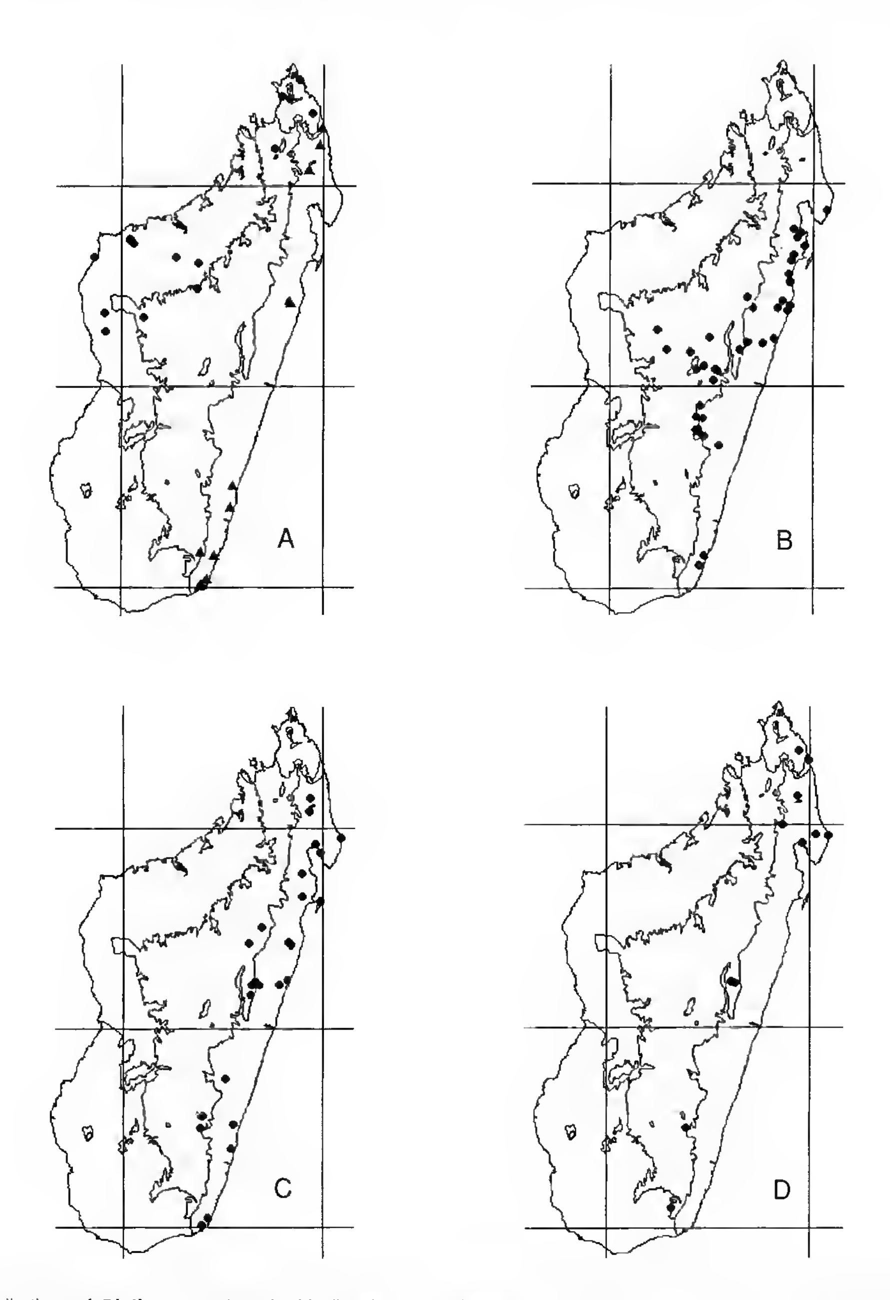


Fig. 4.—Distributions of ***Blotia***, mapped on the bioclimatic zones of Madagascar (after CORNET 1974). **A**, ***B. bemarensis*** (circles) and ***B. leandriana*** (triangles); **B**, ***B. mimosoides***; **C**, ***B. oblongifolia***; **D**, ***B. tanalorum***.

long, 0.5 mm wide, glabrous or patulously hairy. Columella 9-10 mm long, ca. 0.6 mm wide in the middle, base scarcely thickened, apex thickened to 1 mm. Exocarp ca. 0.2 mm thick, reticulate to almost smooth on inner surface. Endocarp 0.4-0.5 mm thick.

Seeds 1-2 per locule, 8-9 mm long, 6-7 mm (1-seeded locules) or 3-4 mm (2-seeded locules) wide, dull, marbled, brown.

DISTRIBUTION.—Eastern Madagascar, transition of humid and subhumid bioclimatic zone (CORNET 1974).

ECOLOGY.— Humid and subhumid forests; 0-800 m.

VERNACULAR NAMES.—Hazondamokana (*SF 7884*, *Zata 4439-RN*).

ICONOGRAPHY.—LEANDRI, Mém. Inst. Sci. Madagascar, Sér. B, Biol. Vég. 8: 241, Fig. 7. (1957), habit, flower; LEANDRI in HUMBERT, Fl. Madagascar 111(1): 127, Fig. 21 (1958), habit, flower, more elaborate version of the same drawings.

SPECIMENS EXAMINED.—MADAGASCAR: *Bernard et al. 64*, Antalaha, Ambohitralalana (Cap-Est), Tanandavahely, Ouest d'Ambato, 15°18'S, 50°29'E, 0-15 m, 12 Oct. 1994 (P!); *Capuron 748-SF*, distr. Sambava, flanc S de L'Anjenabe, vallée de l'Androranga, 800 m (MO!, P!); *Capuron 27298-SF*, Est (Nord), au S de Vohémar, forêt littorale, 11-19 Dec. 1966 (P!); *Decary 5104*, Farafangana, Ivohibe, bord de chemin humide, 1 Oct. 1926 (K!, MO!, P!), type; *Humbert & Capuron 24041*, vallée inférieure de l'Androranga, affl. de la Bemarivo (nord-est) aux environs d'Antongodriha, Mont Anjenabe, 500-600 m, gneiss forêt ombrophile, 3-7 Nov. 1950 (K!, MO!, P!); *Jacquemin 1120*, vestige forestier au P.K. 100, avant Moramanga, 2 Nov. 1972 (P!); *McPherson 14718*, Diego Suarez region, SE of town and SE of Ambilobe, near Daraina on road to Vohemar (Iharana) (D. Meyer's lemur study site), 200-250 m, forest, 19 Dec. 1989 (MO!, P!); *Rajeriarison Euph 37*, Moramanga (P!); *Rakotoson 8189-RN*, Fort Dauphin, Enaniliha, 21 Oct. 1956 (MO!, P!); *Rakoto 8929-RN*, Farafangana, Ivohibe, W of Farafangana, 17 Sep. 1956 (P!); *Service des Eaux et Forêts 7884-SF*, Bealanana, Ankiabe, forêt Belalitra, 12 Sep. 1953 (P!); *Zata 4439-RN*, Antalaha, Ambohitralanana, R.N. 2 (MO!, P!).

EXCLUDED NAME

Blotia oblongifolia (Baill.) Leandri var. *louvelii* Leandri, Notul. Syst. (Paris) 7: 190 (1939), "*louveli*"; in HUMBERT, Fl. Madagascar 111(1): 133 (1958).—Type: *Louvel 77*, Madagascar, Analamazaotra (holo, P!).—The three collections this variety is based on belong to *Savia danguyana*, which LEANDRI described 18 years later (1957: 239) with a different type. In 1958, LEANDRI cited the holotype and two paratypes of *Blotia oblongifolia* var. *louvelii* both under this name (p. 134) and under *Savia danguyana* (p. 120).

Acknowledgements

We are indebted to the curators and directors of the following herbaria who gave us the opportunity to study their collections: A, BM, G, K, M, MO, P, S, TAN, TEF and US. We are also grateful to K. SIKES (MO) and S. COMTET (P), who kindly checked the spelling of many of the Malagasy localities. Field work was conducted under a collaborative agreement between the Missouri Botanical Garden and the Parc Botanique et Zoologique de Tsimbazaza. The authors are grateful to A.-E. WOLF (P) and G. SCHATZ (MO) for their essential help in preparing the maps.

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Manuscript received 22 April 1998;
revised version accepted 25 June 1998.

Deux nouvelles espèces de Flacourtiaceae de l'Ile de Mayotte dans l'Archipel des Comores

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MOTS CLÉS
Flacourtiaceae,
Erythrospermum,
Scolopia,
Archipel des Comores,
Mayotte.

RÉSUMÉ
L'étude des caractères morphologiques permet la description de deux espèces nouvelles de Flacourtiaceae de l'Ile de Mayotte dans l'Archipel des Comores : *Erythrospermum sifarii* Hul, Labat & O. Pascal et *Scolopia maoulidae* Hul, Labat & O. Pascal.

KEY WORDS
Flacourtiaceae,
Erythrospermum,
Scolopia,
Comoro Archipelago,
Mayotte.

ABSTRACT
A study of morphological characters supports the description of two new species of Flacourtiaceae from Mayotte Island in the Comoro Archipelago : *Erythrospermum sifarii* Hul, Labat & O. Pascal and *Scolopia maoulidae* Hul, Labat & O. Pascal.

Les inventaires floristiques récents des plantes indigènes ou naturalisées de Mayotte menés par le Service Environnement et Forêts (SEF) en collaboration avec le Muséum national d'Histoire naturelle de Paris ont permis d'approfondir la connaissance de cette flore insulaire. Les récoltes systématiques réalisées lors de ce projet ont notablement enrichi les collections herbariologiques peu abondantes et souvent anciennes. L'étude de ce nouveau matériel et la révision des spécimens de l'Archipel des Comores présents dans l'herbier du Muséum de Paris (P) ont abouti à l'identification de plusieurs taxons nouveaux. Une espèce de Sapotaceae a déjà été décrite (LABAT, PIGNAL & PASCAL 1997) ainsi que trois espèces d'Oleaceae (LABAT, PIGNAL & PASCAL sous presse).

L'examen de ce nouveau matériel nous a conduit ensuite à reconnaître deux nouvelles espèces appartenant à la famille des Flacourtiaceae, qui sont décrites ici : *Erythrospermum sifarii* et *Scolopia maoulidae.*

Dans sa révision des Flacourtiaceae de Madagascar et des Comores, PERRIER DE LA BÂTHIE (1946) signalait que trois espèces existaient sur l'Ile de Mayotte : *Flacourtia ramontchi* L'Hér. (= *F. indica* (Burm. f.) Merr.), *Scolopia coriacea* Tul. et *Ludia comorensis* H. Perrier. L'étude des collectes récentes et les observations sur le terrain réalisées à Mayotte ont confirmé la présence de ces trois espèces sur l'île ; mais également, une autre espèce, *Ludia mauritiana* J.F. Gmel., a été trouvée et identifiée pour la première fois dans l'Archipel des Comores. Ceci porte donc à six le nombre total de Flacourtiaceae des Comores, connues actuellement.

La nouvelle espèce *Erythrospermum sifarii* de l'Ile de Mayotte augmente ainsi l'aire de répartition du genre *Erythrospermum* Lam., depuis l'Ile Maurice, dans l'Océan Indien (SLEUMER 1954, 1980), en passant par Sri Lanka (ALSTON 1931 ; VERDCOURT 1996), jusqu'aux Iles Fidji, dans l'Archipel de la Mélanésie (PARHAM 1972 ; SMITH 1981). PERRIER DE LA BÂTHIE (1946) notait la présence de deux espèces à Madagascar, mais d'après SLEUMER (1980), il s'agit vraisemblablement de récoltes mal étiquetées provenant en réalité de l'Ile Maurice ; il n'existerait donc pas à ce jour de représentant connu du genre *Erythrospermum* à Madagascar. En ce qui concerne le genre paléotropical *Scolopia* Schreb., dont la révision monographique a été effectuée par SLEUMER (1972), il compte au total 27 espèces et deux variétés, parmi lesquelles 21 espèces se trouvent en Afrique (dont 15 à Madagacar, aux Comores et aux Mascareignes), 15 en Asie du Sud-Est et en Mélanésie (incl. la Nouvelle Irlande) et une en Australie. Par ailleurs, la nouvelle espèce *S. maoulidae* s'ajoute à l'espèce déjà connue à Mayotte, *S. coriacea* Tul. (TULASNE 1868 ; PERRIER DE LA BÂTHIE 1946 ; SLEUMER 1972), ce qui porte à deux le nombre total d'espèces du genre *Scolopia*, se trouvant dans l'Archipel des Comores.

Erythrospermum sifarii Hul, Labat & O. Pascal, **sp. nov.**

E. zeylanici (Gaertn.) Alston *affinis, sed oblongis vel oblongis-obovatis vel oblongis-ellipticis, chartaceis vel subcoriaceis foliis ; densorum racemorum inflorescentiis, eciliato glabroque perianthio, omnino glabris antheris, sessili ovario, brevissimo, minus quam 1 mm longo stylo, praecipue differt.*

TYPE. — *Labat & Pascal 2930*, Mayotte, Massif du Bénara, layon SEF, versant Nord en montant sur le Lima Tchaourembo, 12°52'S, 45°08'E, 350 m, 2 déc. 1997, fl. fr. (holo-, P (P80587) ; iso-, K, MAYOTTE, P (P80586, P80585 et P80588 in alcool)).

Arbre de 15-20 m de hauteur, inerme ; rameaux glabres. Feuilles alternes, sans stipules ; pétiole long de 1-2 cm, glabre, rougeâtre ; limbe oblong à oblong-obovale ou oblong-elliptique, ± aigu, parfois ± obtus à la base, acuminé au sommet, (11-)14-20 × 3-6,5 cm, chartacé à subcoriace, légèrement denté à subentier, glabre, vert clair, brillant sur la face inférieure ; nervures secondaires 5-8 paires.

Inflorescences en grappes denses, axillaires, longues de 3-15 cm. Fleurs blanches, groupées par 3-4 en glomérules le long du rachis ; bractées minuscules, triangulaires (0,5 × 0,5 mm), pubescentes ; pédicelle long de 3-5 mm, atteignant 6-7 mm sous le fruit, pubérulent. Pièces externes du périanthe 5, elliptiques, 3,5 × 2,5 mm, très concaves, glabres ; pièces internes 5, elliptiques,

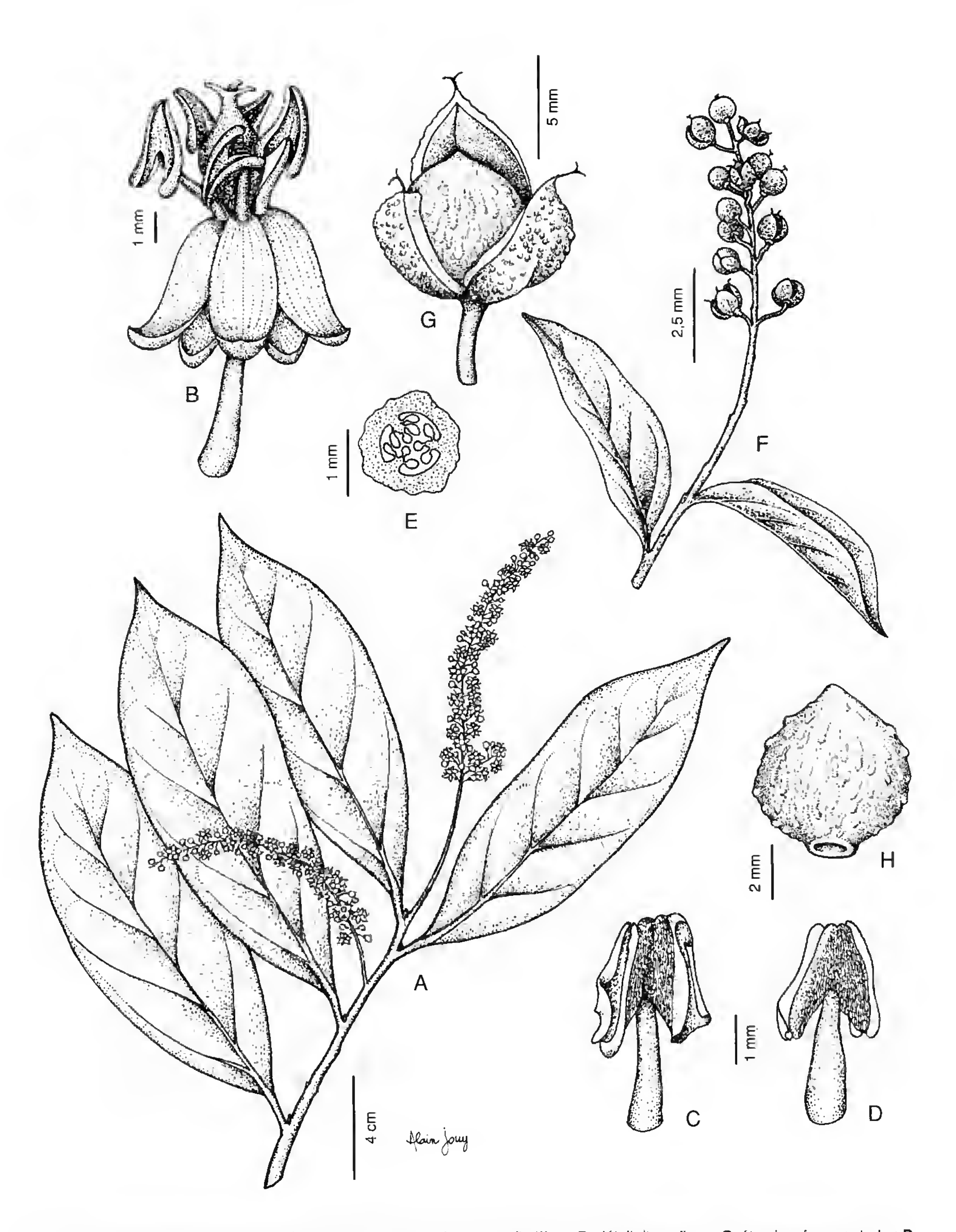


Fig. 1. — ***Erythrospermum sifarii*** Hul, Labat & O. Pascal : **A**, rameau florifère ; **B**, détail d'une fleur ; **C**, étamine, face ventrale ; **D**, étamine, face dorsale ; **E**, coupe transversale de l'ovaire ; **F**, rameau fructifère ; **G**, fruit ; **H**, graine. (A-H, *Labat & Pascal 2930*).

sensiblement de même taille que les précédentes, 3 × 2(-1,5) mm, glabres. Étamines 5 ; filets longs de 2,5 mm, glabres, amincis au sommet ; anthères longues de 2-2,5 mm, fortement sagittées, glabres. Ovaire rougeâtre, glabre, à 3 placentas multi-ovulés ; style très court, inférieur à 1 mm de longueur, terminé par 3 branches stigmatiques courbées.

Fruits : capsules globuleuses, de 0,7-1 cm de diamètre, apiculées, lisses, devenant verruqueuses sur le sec, facilement déhiscentes en 3(-4) valves. Graines (1-)2-6, ± anguleuses, entourées d'un arille rouge. — Figs. 1, 2.

DISTRIBUTION. — Espèce connue seulement de l'Ile de Mayotte.

ÉCOLOGIE. — Arbre peu fréquent des reliques de forêts denses sempervirentes à *Olea capensis* de 20-25 m de hauteur et des émergents de 30 m, sur les hauts de pente des massifs du Bénara et du M'Sapéré, sur sol brun évolué et andosols ferralitiques remaniés, caillouteux sur phonolite.

PHÉNOLOGIE. — Floraison en décembre, fructification jusqu'en mars.

NOM VERNACULAIRE. — Souririni Vavi.

Erythrospermum sifarii a des affinités avec l'espèce asiatique du Sri Lanka, *E. zeylanicum* (Gaertn.) Alston. Elle s'en distingue principalement par ses feuilles oblongues à oblongues-obovales ou oblongues-elliptiques, chartacées à subcoriaces ; ses inflorescences sont en grappes denses (fleurs groupées par 3-4 en glomérules le long des racèmes) ; les pièces du périanthe ainsi que les étamines sont glabres, non ciliées ; l'ovaire sessile présente un style très court (inférieur à 1 mm) qui se termine par 3 branches stigmatiques courbées.

PARATYPE. — MAYOTTE : *Pascal 406*, Bénara, 450 m, 5 mars 1996, fr. (G, K, MAYOTTE, MO, P, WAG).

Cette espèce est dédiée à Ali Bacar SIFARI, agent du Service Environnement et Forêts de Mayotte, pour son sérieux, son enthousiasme et ses précieuses qualités de grimpeur. Sans son aide, une grande partie du travail de collecte n'aurait pu être mené à bien.

Scolopia maoulidae Hul, Labat & O. Pascal, **sp. nov.**

S. erythrocarpae H. Perrier *affinis, sed rhombeis vel ellipticis-obovatis foliis ; multifloris inflorescentiis, pubescenti saepe plus quam 2 mm longitudine pedicello, extus pubescentibus vel glabrescentibus sepalis petalisque, numerosioribus (60-80) staminibus, numerosis (15-20) glandis cincto disco, praecipue differt.*

TYPE. — *Pascal 855*, Mayotte, Dapani, 150 m, 7 jan. 1997, fl., j. fr. (holo-, P (P 116658) ; iso-, B, BR, G, K, MAYOTTE, MO, P (P 116656, P116657 et P116659 in alcool), NY, WAG).

Arbre de 12-15 m de hauteur, inerme ; rameaux glabres ; écorce lisse, gris clair à verdâtre. Feuilles à stipules minuscules, ± caduques; pétiole long de 2-3(-4) mm, glabre ; limbe rhomboïdal à elliptique ou elliptique-obovale, atténué et cunéiforme à la base, ± arrondi et émarginé au sommet, 3-6(-7) × (1,5-)2-3(-4) cm, coriace, subentier sur les feuilles adultes, nettement dentelé sur les feuilles des plantules et des rejets, glabre, vert clair et brillant sur la face supérieure, blanchâtre et mat sur la face inférieure, penninerve ; nervures secondaires 5-6 paires ; nervation tertiaire en réseau ± visible sur les deux faces.

Inflorescences en grappes contractées, axillaires, 5-12-flores. Fleurs soutenues par de petites bractées, triangulaires (de 0,5 × 1 mm) et pubescentes ; pédicelle long de 2-2,5 mm, pouvant atteindre 5-7(-8) mm sous le fruit, articulé un peu au-dessus de la base, pubescent à glabrescent ; sépales 4, deltoïdes, 1,5 × 1-1,5 mm, pubescents à glabrescents extérieurement ; pétales 4, triangulaires à subulés, 1-1,5 × 0,2-0,5 mm, ± pubescents sur la face extérieure ; disque portant des poils à la base des filets staminaux et entouré par une couronne de 15-20 petites glandes ciliées ; étamines nombreuses (60-80) ; filets grêles, longs de 2,5-3 mm, glabres ; anthères courtement appendiculés au sommet ; ovaire glabre, à 2- 4 placentas 2-ovulés ; style court, de 1-1,5 mm de longueur, divisé au sommet en 4 branches stigmatiques lobulées.

Fruits : baies ovoïdes ou subglobuleuses, 10-15 × 8-12 mm, orangées à maturité ; graines 5-6, à testa crustacé et à tégument interne papyracé. — Figs. 2, 3.



Fig. 2. — ***Erythrospermum sifarii*** Hul, Labat & O. Pascal : **A**, inflorescence ; **B**, infrutescence. (*Labat & Pascal 2930*). — ***Scolopia maoulidae*** Hul, Labat & O. Pascal : **C**, rameau fructifère ; **D**, rameau florifère. (C, *Pascal 457* ; D, *Pascal 855*). — A, B, photo J.-N. Labat ; C, D, photo O. Pascal).

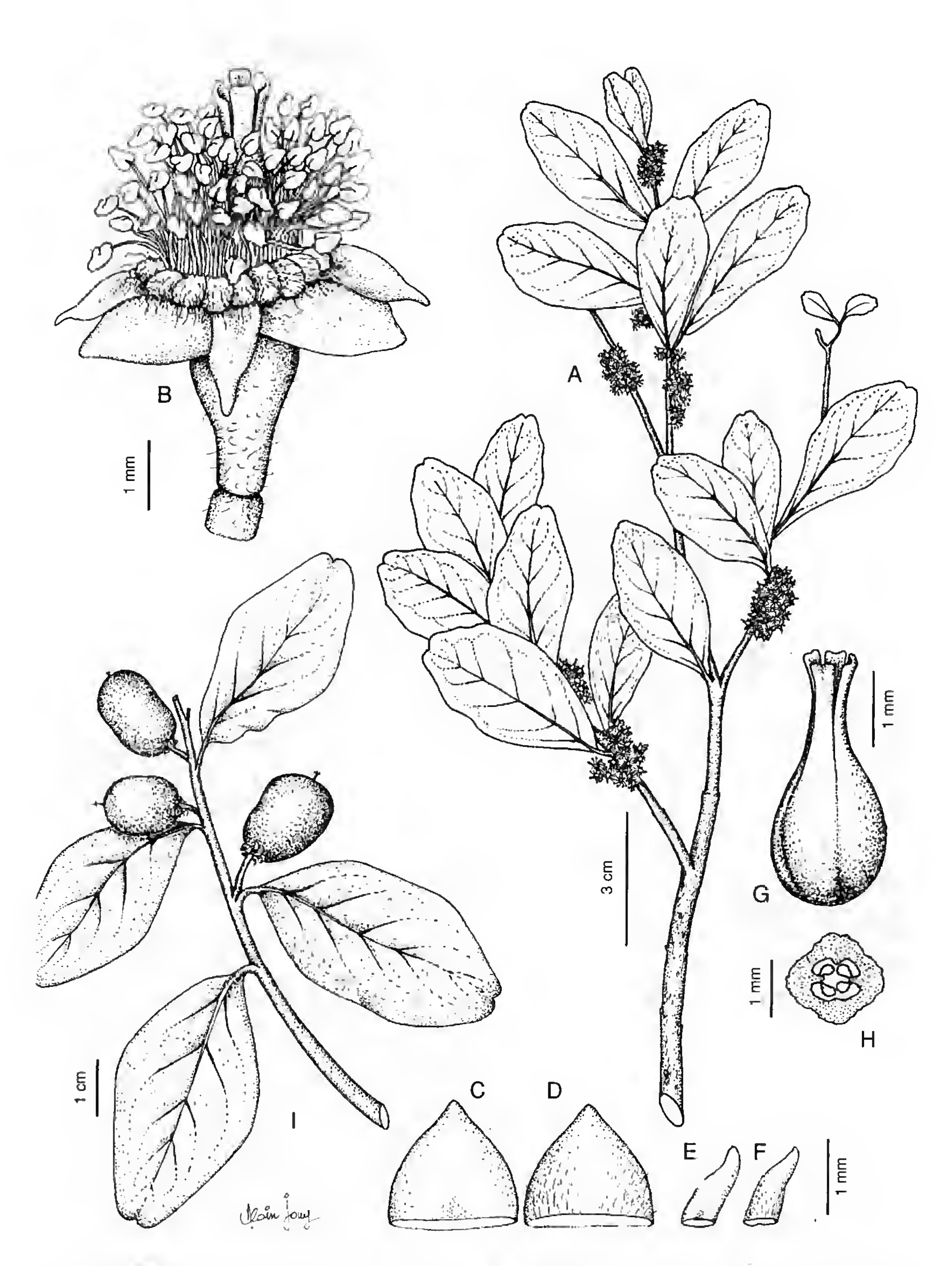


Fig. 3. — ***Scolopia maoulidae*** Hul, Labat & O. Pascal : **A**, rameau florifère ; **B**, détail d'une fleur ; **C**, sépale, face interne ; **D**, sépale, face externe ; **E**, pétale, face interne ; **F**, pétale, face externe ; **G**, gynécée ; **H**, coupe transversale de l'ovaire ; **I**, rameau fructifère. (A-H, *Pascal 855*; I, *Pascal 457*).

DISTRIBUTION. — Espèce connue seulement de l'Ile de Mayotte.

ÉCOLOGIE. — Arbre caractéristique d'une relique de forêt semi-sèche, située dans la partie méridionale de la Réserve Forestière de Dapani au sud de l'île. Les espèces associées de cette forêt de transition sont notamment, pour les arbres, *Ravensara areolata* Kosterm., *Grisollea myrianthea* Baill. et *Poupartia gummifera* Sprague. *Scolopia maoulidae* n'a pas été trouvé en dehors de cette formation particulière.

PHÉNOLOGIE. — Floraison seulement connue en janvier et fructification en janvier, février et avril.

NOMS VERNACULAIRES. — Luangati Mena, Tsatsiki Simbitri.

Cette espèce de Mayotte est proche de l'espèce malgache *Scolopia erythrocarpa*. Elle s'en distingue nettement par ses feuilles à limbe rhomboïdal à elliptique-obovale ; par ses inflorescences multiflores, ses fleurs à pédicelle pubescent et ayant 2-2,5 mm de longueur, ses sépales et pétales ± pubescents sur la face externe, ses étamines beaucoup plus nombreuses (60-80) ; enfin, par le disque du réceptacle entouré par une couronne de nombreuses petites glandes (15-20), ciliées.

PARATYPES. — *Pascal 346*, Mayotte, Dapani, 17 jan. 1996, fr. (K, MAYOTTE, MO, P, WAG) ; *Pascal 348*, ibid., 23 jan. 1996, fr. (K, MAYOTTE, MO, P) ; *Pascal 457*, ibid., 250 m, 11 avr. 1996, fr. (K, MAYOTTE, MO, P, WAG) ; *Pascal 887*, ibid., 150 m, 11 fév. 1997, fr. (G, K, MAYOTTE, MO, P).

Cette espèce est dédiée à Maoulida MCHANGAMA, agent du Service Environnement et Forêts de Mayotte. Par sa connaissance de la flore mahoraise, il a largement contribué au succès du travail d'inventaire réalisé par le SEF et le MNHN de 1995 à 1998.

NOTE. — L'herbier cité « MAYOTTE » ne possède pas d'acronyme officiel, il s'agit de l'herbier du Service Environnement et Forêts de Mayotte.

Remerciements

Les auteurs adressent de sincères remerciements à Alain JOUY, qui a réalisé les dessins, et à Jacques FLORENCE (ORSTOM, P) pour les diagnoses latines.

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Manuscrit reçu le 24 juin 1998 ;
version révisée acceptée le 7 septembre 1998.

Novitates Gabonenses 33. A new species of *Pseudocalyx* (Acanthaceae) from Gabon with a synopsis of all species of this genus

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KEY WORDS
Pseudocalyx,
Gabon,
biodiversity.

ABSTRACT
Pseudocalyx pasquieri is described from Gabon and illustrated. A key to the species is given and their distribution, demonstrating once more Gabon's biodiversity, is mapped. All species of *Pseudocalyx* are illustrated.

MOTS CLÉS
Pseudocalyx,
Gabon,
biodiversité.

RÉSUMÉ
Pseudocalyx pasquieri du Gabon est décrit et illustré. Une clé des espèces est donnée, ainsi que leur distribution qui démontre une fois de plus la haute biodiversité du Gabon. Toutes les espèces du genre *Pseudocalyx* sont illustrées.

A few years ago a new species of *Pseudocalyx*, *P. libericus*, was published (BRETELER 1994). This publication was accompanied by some notes on the generic delimitation of *Pseudocalyx* and by a key to the five species which were then recognized.

New collections from Gabon have revealed the presence of a new species, *P. pasquieri*, as well as, for the first time, flowering material of *P. aurantiacus* Benoist, hitherto only known from the type material collected by LE TESTU.

The number of species recognized in the following key remains five because *P. africanus* S. Moore is united with *P. saccatus* Radlk., the type species.

Key to the species

1. Pedicel up to 5 mm long (Liberia) .... **P. libericus**
1'. Pedicel at least 10 mm long 2
2. Corolla 9-15 mm long; anthers ca. 5 mm long (Gabon) .... **P. macrophyllus**
2'. Corolla at least 20 mm long; anthers at least 10 mm long 3
3. Flowers drooping at anthesis, axillary or arranged in mostly stout, (sub-)erect inflorescences; pedicel 1-1.5 cm long (Congo Kinshasa, Madagascar, Mozambique, Tanzania, Zambia, Zimbabwe) .... **P. saccatus**
3'. Flowers drooping at anthesis, arranged in long, pendent, aphyllous inflorescences; pedicel (1.5-)2-3.5 cm long (Gabon) 4
4. Leaves cuneate at base; flowers solitary (i.e. at most 2 per node); calyx distinctly 5-lobed, 6-8 mm long; stamens inserted 14 mm above base of corolla; style erect and straight in lower part, gently curved in upper part .... **P. aurantiacus**
4. Leaves obtuse to subcordate at base; flowers more than 2 per node; calyx irregularly lobed to dentate, 1-2 mm high; stamens inserted 8 mm above base of corolla; style sharply bent just above ovary .... **P. pasquieri**

Brief treatment of the species

Pseudocalyx aurantiacus Benoist

Bull. Soc. Bot. France 85: 678 (1938); Notul. Syst. (Paris) 11: 149 (1944); Heine, Acanthaceae, Flore du Gabon 13: 55 (1966); Breteler, Kew Bull. 49: 810 (1994).—Type: *Le Testu 7790*, Gabon, Nzila, Lastoursville region (holo-, P; iso-, BM, BR, K).—Figs. 1, 6.

SPECIMENS EXAMINED.—GABON: *Breteler & Jongkind 10652*, Bambidie, ca. 30 km E of Lastoursville, fl. buds Nov. (WAG); *F.J. & B.J.M. Breteler 12575*, fl. Dec. (WAG); *Le Testu 7790*, Nzila, Lastoursville region, fl. buds Dec., type (BM, BR, K, P); *Le Testu 7790 bis*, eod. loc. (BR).

NOTES.— The following description of the corolla, the stamens, and the pistil is made from *F.J. & B.J.M Breteler 12575*, the only specimen with open flowers.

Corolla white, ca. 4 cm. long, sparsely stellate-hairy mainly on both surfaces of the lobes and with simple, subappressed hairs pointing downwards on the upper part of the tube inside; lobes rounded apically, 2 broad ones of 3 × 5-7 mm and 3 narrow ones of 10 × 3 mm; stamens attached 14 mm from the base of the corolla, anthers deeply and narrowly sagittate at base, 10-11 mm long, the thecae long-papillate adaxially, opening by an apical pore, filaments ca. 7 mm long, glabrous; staminode minute, glabrous; disc firm, smooth, glabrous, ca.1 mm thick; pistil 32 mm long, glabrous; ovary subellipsoid, laterally compressed, ca. 2.5 mm long; style usually protruding, curved in upper part, shortly 2-lobed apically.

HEINE (1966), contrary to BENOIST and the description given above, described the ovary as densely covered by stellate hairs, but in the illustration accompanying his description a glabrous ovary is depicted.

Pseudocalyx libericus Breteler

Kew Bull. 49: 809 (1994).—Type: *van Meer 269*, Liberia, Bomi Hills, Gola-Yoma Nat. Forest (holo-, WAG; iso-, BR).—Figs. 2, 6.

SPECIMENS EXAMINED.—LIBERIA: *Bos 2320*, Bomi Hills, Gola Nat. Forest, fl. Dec. (WAG); *Goll 54*, 9 miles N of Bomi Hills, fl. Nov. (WAG); *van Meer 269*, Bomi Hills, Gola-Yoma Nat. Forest, fl. Dec., type (BR, WAG).

Pseudocalyx macrophyllus McPherson & A.M. Louis

Bull. Mus. Natl. Hist. Nat., B, Adansonia 13: 57 (1991); Breteler, Kew Bull. 49: 810 (1994).—Type: *McPherson 13826*, Gabon, Lopé Reserve (holo-, MO; iso-, BR, G, WAG).— Figs. 3, 6.

SPECIMENS EXAMINED.—GABON: *Breteler & Jongkind 10938*, 5-30 km NNW of Ndjolé, fl. Apr. (BR, C, G, K, LBV, MA, MO, NY, P, PRE, WAG); *11063*, fl. Apr. (BR, C, G, IEC, K, LBV, MA, MO, NY, P, PRE, W, WAG); *McPherson 13826*, Lopé Reserve, fl. Mar., type (BR, G, WAG).

NOTE.—MCPHERSON & LOUIS noted in the original description that the staminode was absent. In the flowers analyzed for this study the staminode was always present (see Fig. 3M).

Pseudocalyx pasquieri Breteler, **sp. nov.**

P. aurantiaco Benoist *affinis, foliis basi obtusis vel subcordatis, calyce breviore irregulariter lobato, staminibus tubo magis basaliter insertis, stylo acute flexo propre basin, differt.*

TYPE.—*F.J. & B.J.M. Breteler 12202*, Gabon, ca. 35 km E of Lastoursville (holo-, WAG; iso-, BR, K, LBV, MA, MO, P, PRE).

Liana. Branches densely stellate-hairy, glabrescent. Leaves: petiole 1-2.5 cm long, stellate-hairy, glabrescent; blade subcoriaceous, obovate-elliptic, (6-)12-15(-22) × (2-)5-7(-11) cm, (1-)1.5-3 times as long as wide, obtuse to subcordate at base, shortly and abruptly acuminate at apex, the acumen ca. 5 mm long, with 6-9 main lateral nerves on each side of the midrib, sparsely stellate-hairy, more densely so on midrib especially above, glabrescent. Inflorescence pendent, aphyllous, orange-red (main axis as well as pedicels), densely stellate-hairy (scabrid), with up to 12 flowering nodes, with 3 or more flowers per node, the internodes 3-4.5 cm long in the basal part, decreasing to 2 cm long in apical part; pedicel (2.5-)3-3.5 cm long, hairy as bracteole; bracteoles ovate-elliptic, 20-25 × 12-17 mm, stiffly coriaceous, densely orange-red stellate-hairy outside, sparsely so inside. Calyx rather thin, 1-2 mm

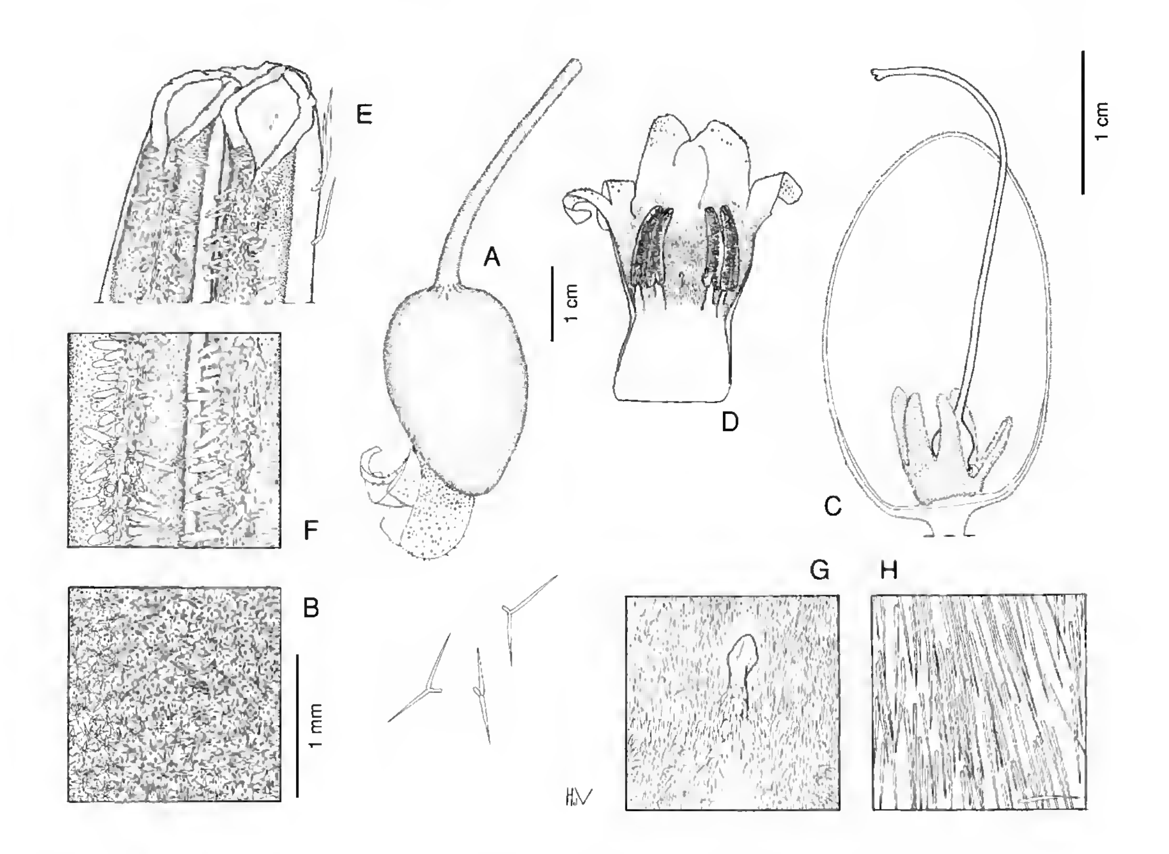


Fig. 1.—***Pseudocalyx aurantiacus***: **A**, flower; **B**, detail indumentum of bracteole outside; **C**, bracteole inside with calyx and pistil; **D**, corolla inside; **E**, apical part of anther; **F**, detail of anther adaxially; **G**, staminode; **H**, detail of indumentum of corolla inside; **I**, detail of hairs on base of staminode. (A-H, *F.J. & B.J.M. Breteler 12575*). Drawing by H. DE VRIES.

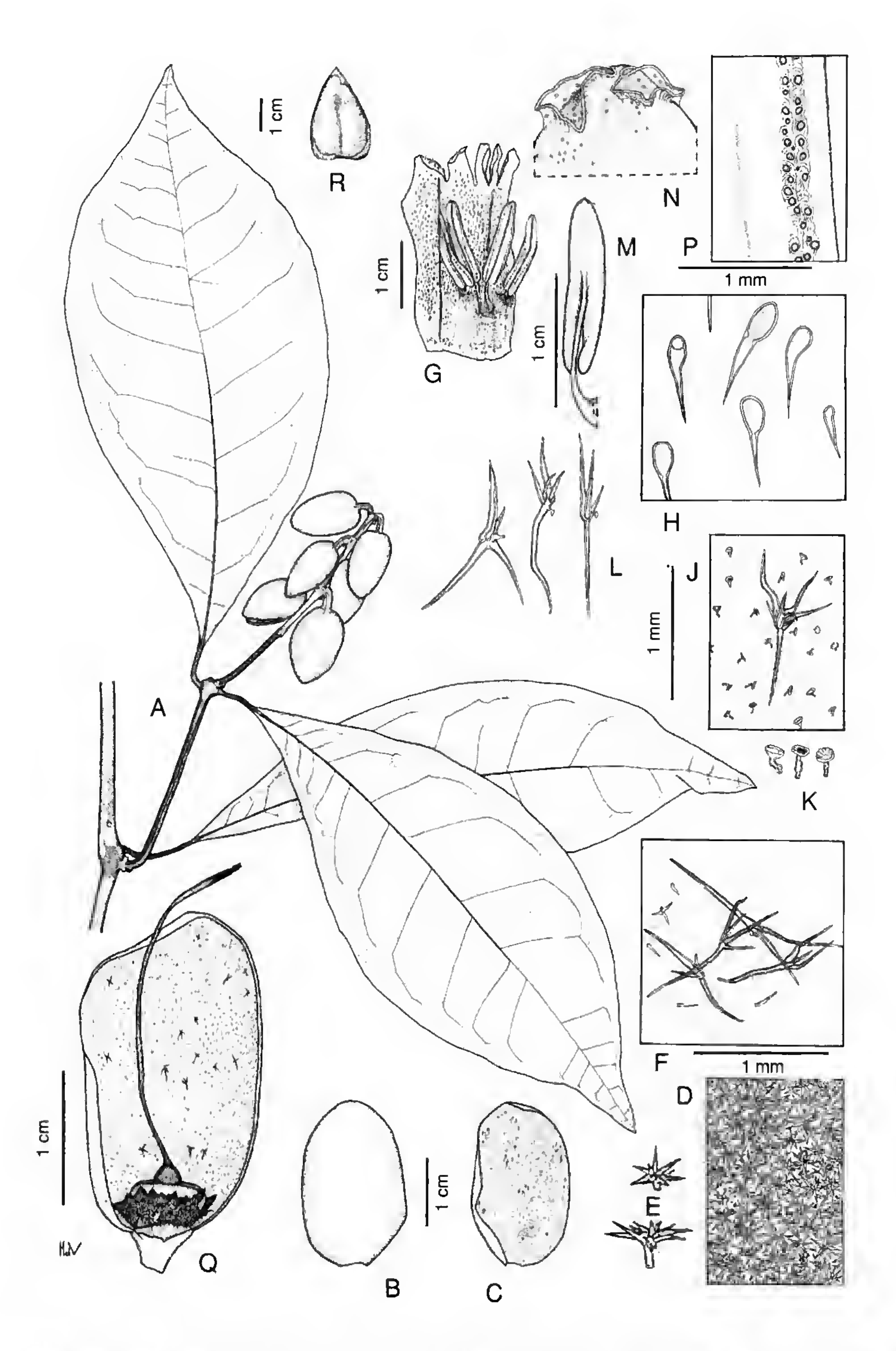


Fig. 2.—***Pseudocalyx libericus***: A, flowering branch; **B**, **C**, bracteole both sides; **D**, detail of bracteole indumentum outside; **E**, individual hairs detail of **D**; **F**, detail of bracteole indumentum inside; **G**, open corolla; **H**, detail of corolla hairs inside; **J**, detail of corolla indumentum outside; **K**, stalked capitate glandular hairs; **L**, hairtype of calyx and corolla showing point of attachment; **M**, stamen outside; **N**, apex of anthers from inside showing pores; **P**, detail of anther cell with glandular hairs; **Q**, pistil with disc and calyx and bracteole; **R**, fruit with remnants of indumetum. (A-Q, *van Meer 269;* R, *Bos 2320)*. Drawing by H. de Vries.

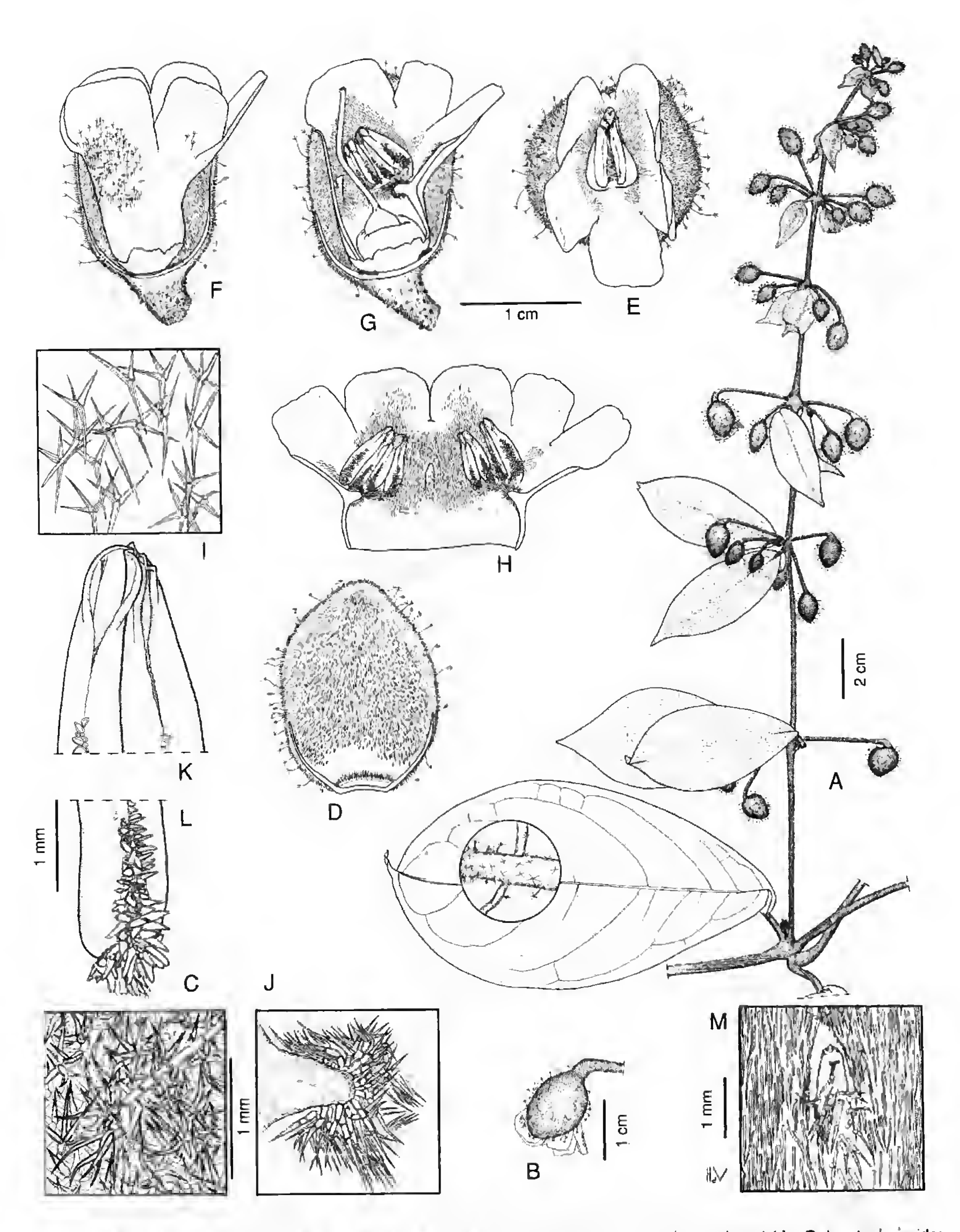


Fig. 3.- ***Pseudocalyx macrophyllus***: **A**, flowering branch; **B**, flower; **C**, detail indumentum bracteole outside; **D**, bracteole inside; **E**, flower seen from above; **F**, flower, one bracteole removed; **G**, flower cut lengthwise; **H**, open corolla; **I**, detail indumentum corolla outside; **J**, detail of rim on corolla inside; **K**, apical part of anther; **L**, lower part of anther; **M**, detail of indumentum on corolla inside with staminode. (A-M, *Breteler et Jongkind 10938)*. Drawing by H. DE VRIES.

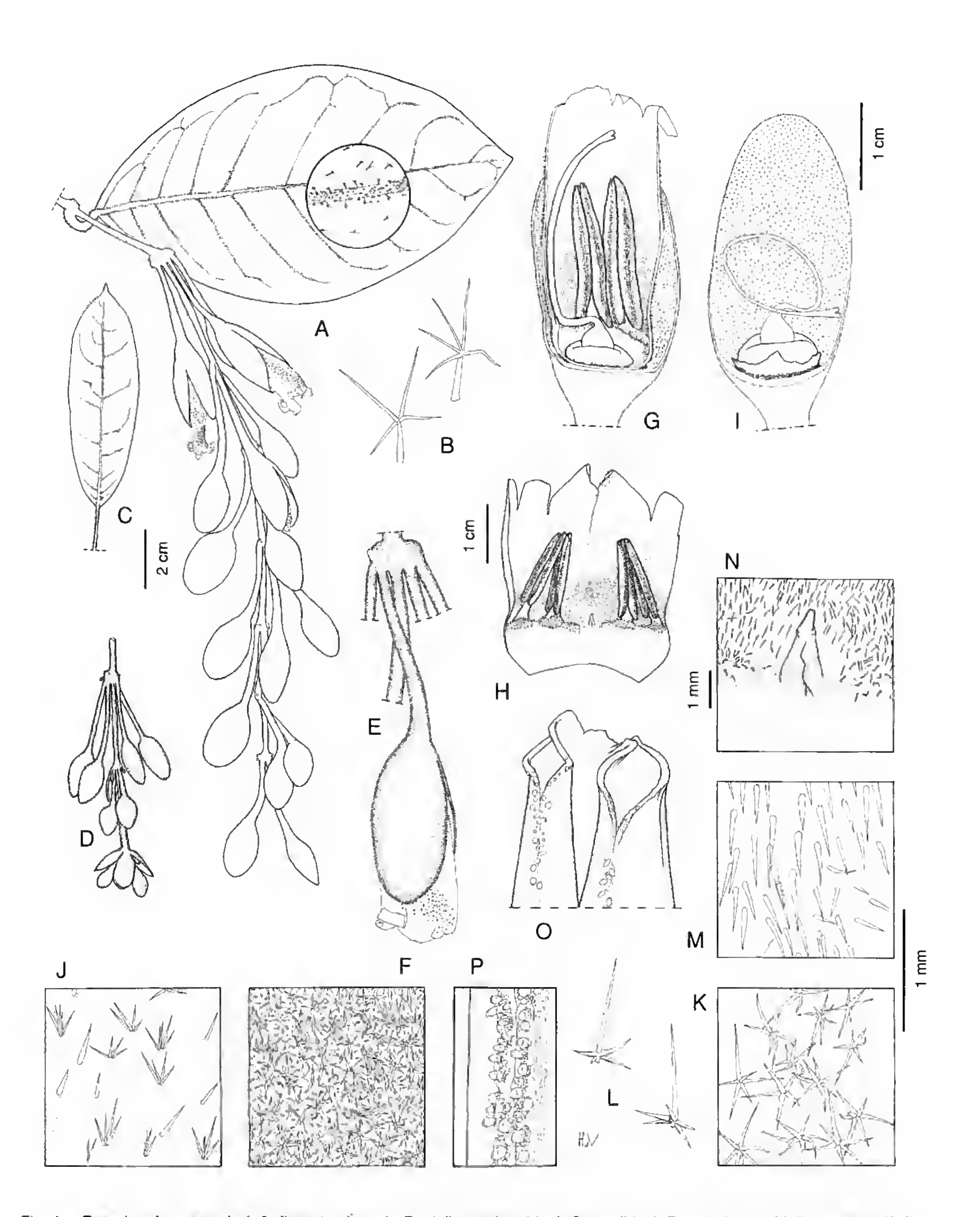


Fig. 4.—***Pseudocalyx pasquieri*****: A**, flowering branch; **B**, stellate hairs of leaf; **C**, small leaf; **D**, apical part of inflorescence; **E**, flower; **F**, detail indumentum bracteole outside; **G**, flower cut lengthwise; **H**, open corolla; **I**, bracteole inside with calyx and pistil; **J**, detail indumentum bracteole inside; **K-L**, detail indumentum of corolla outside; **M**, detail indumentum of corolla inside; **N**, staminode; **O**, apical part of anther; **P**, detail of anther adaxially. (A,B,E, *F.J. & B.J.M. Breteler 12195*; C-D, *Breteler & Jongkind 10832*; F-P, *F.J. & B.J.M. Breteler 12202*). Drawing by H. DE VRIES.

high, irregularly dentate, glabrous. Corolla white, laterally flattened, 3-3.5 cm long, ca. sparsely stellate-hairy outside, ca. glabrous inside except for the rim bearing the stamens and in a zone above this rim with simple hairs; lobes contorted in bud, obtuse to emarginate at apex, ca. rectangular, 4-6 mm long, up ro 8 mm wide. Stamens glabrous, inserted on the tube ca. 8 mm above its base; anthers 13-15 mm long, deeply narrowly sagittate, thecae shortly papillate adaxially, dehiscent by an apical pore; filaments firm, 3-8 mm long; staminode minute, glabrous. Disc firm, ca. 2 mm thick, smooth, glabrous, impressed centrally. Pistil glabrous; ovary ca. ovate, laterally compressed, 2-2.5 mm long; style 20-30 mm long, sharply bent just above the ovary, tip protruding or not, two-lobed apically. Fruit unknown.—Figs. 4, 6.

SPECIMENS EXAMINED.—GABON: *Breteler & Jongkind 10832*, ca. 35 km E of Lastoursville, fl. Nov. (WAG); *F.J. & B.J.M Breteler 12195*, eod. loc. (LBV, P, WAG); *12202* , eod. loc., type (BR, K, LBV, MA, MO, P, PRE, WAG).

NOTES.—*P. pasquieri* has so far been collected only in a small area of tropical rain forest ca. 35 km E of Lastoursville. Flowering is very conspicuous, but this mostly occurs in the crown of medium sized trees and not within a few meters above the forest floor. This may be the reason why this species has not been collected before.

Besides the characters mentioned in the key to the species, *P. pasquieri* may also be distinguished from *P. aurantiacus* by the generally longer and narrower inflorescences which are darker coloured and of which the main axis has the same colour as the pedicels and bracteoles. In *P. aurantiacus* the inflorescence axis is pale brown to grey, in contrast to the orange-red of the pedicels and bracteoles.

This species has been named *P. pasquieri* to honour Mrs. and Mr. PASQUIER for their generous hospitality repeatedly shown at Bambidie, the seat of the Compagnie Équatoriale de Bois (CEB). Mr. PASQUIER always demonstrated a great interest in the botanical exploration of the area East of Lastoursville where his company plays such an important role.

Pseudocalyx saccatus Radlk.,

Abhandl. Natürw. Verein Bremen 8: 417 (1883); Benoist, Not. Syst. 11: 149 (1944); in Humbert, Flore de Madag. et Comores, fam. 182 (1), Acanthacées: 20 (1967); Breteler, Kew Bull. 49: 812 (1994).— Type: *Rutenberg s.n.*, Madagascar, Nossi-be, fl. May (holo-, BREM) n.v., see notes below.—Figs. 5, 6.

P. africanus S. Moore, Journ. Linn. Soc., Bot. 40: 156 (1911); Breteler, Kew Bull. 49: 812 (1994).—Type: *Swynnerton 97*, Zimbabwe, Chirinda Forest (holo-, K).

SPECIMENS EXAMINED.—CONGO (Kinshasa): *Bequaert 1863*, Avakubi, fl. Jan. (BR, K,); *Bequaert 2933*, Irumu, fl. Apr. (BR); *Bequaert s.n.*, Avakubi, fl. Jan. (BR); *Casier 226*, Muetshi, fl. buds Jan. (BR, WAG); *Casier 460*, fl. buds July (BR, WAG); *Casier 469*, fl. Jan. (BR, P, WAG); *Germain 5304*, Homas Mt., Irumu, fl. buds July (BR); *Lejoly 82/632*, Ubundu, fl. Nov. (BR); *Lisowski 10134*, Luapula R., Kyalwe Falls, fl., fr. Mar. (BR, K); *Malaisse 13833*, Kasenga, fl. Apr. (BR, K, P, WAG); *Mullenders 494*, Kaniamo, fl. Apr. (BR, K); *Vanderyst 22912, 22923, 23256, 23257, 23258*, Merode (BR); *Vanderyst 23371, 23387*, Merode, fl. Apr. (BR).—MADAGASCAR: *Barnett et al. 397*, between Ambaranala and Tsiroanomandidy, fl. Jan. (K, P, WAG); *Baron 4762, 4770, 4915, 5864*, Central Madagascar (K, P); *Baron 5865*, NW Madagascar (K); *Baron 6215*, N Madagascar (K, P); *Boivin s.n.*, Baie de Cassandura, fl. buds (P); *Botoalina 11119*, Ambalona, fl. buds Feb. (P); *Decary 940, 1569, 1572, 1596, 2227*, Maromandia, fl. buds, fl. Mar.-Sep. (P); *Decary 15623*, Besalampy, fr. Sep. (P); *Decary 18988*, Ioala, fl. Apr, (P); *Decary s.n.*, Ankarafanrsika, 7[e] Réserve Forestière (K); *Douillot s.n.*, s.loc., fl. buds (P); *Du Puy et al. MB 769*, 16 km W of Marerano, fl. Mar. (K, P); *Gentry 11798*, Maevatanana, fl. juv. fr., May (K); *Gentry 11903*, Diego Suarez, fl. May (K, P); *Humbert 19051*, collines de l'Ankarana, fl. Dec.-Jan. (P); *Humbert & Capuron 25886*, Ambilobe, fl. buds Mar. (P); *Leandri 942, 1080*, Tsingy du Bemaraha, fl. buds (P); *Leandri, Capuron & Razafindrakoto 2013*, Tsiandro, fl. buds Dec. (P); *Leandri & Capuron 2347*, Tsiandro, fl. Jan. (P, WAG) *Leandri & Saboureau 2820*, Antsingy, fl. buds Jan. (K, WAG); *J. & M. Peltier 5217*, Tsaramandroso, fl. buds Mar. (K,P); *Perrier de la Bâthie 586*, Firingalava, fl. Apr. (P); *Perrier de la Bâthie 5925*, Kinkony, fl. buds June (P, WAG); *Poisson 133*, Sakaramy plateau, fl. buds May (P); *Réserves Naturelles 5126-RN*, *Rakotovao*, Soalala, fl. buds Mar. (K, P); *Réserves Naturelles 1858-RN*, *Ramamoryisara*, Berono, fl. buds Feb. (P); *Réserves Naturelles 5140-RN*, *Ramamoryisara*, R.N. 7, fl. Mar. (K, P); *Schatz et al. 2722*, Antsiranana, fl. May (K, P).—MOZAMBIQUE: *Munch 133*, Garuso Mts., fl. Aug. (K).—TANZANIA: *Gillett 17989*, Rondo, fl. Nov.

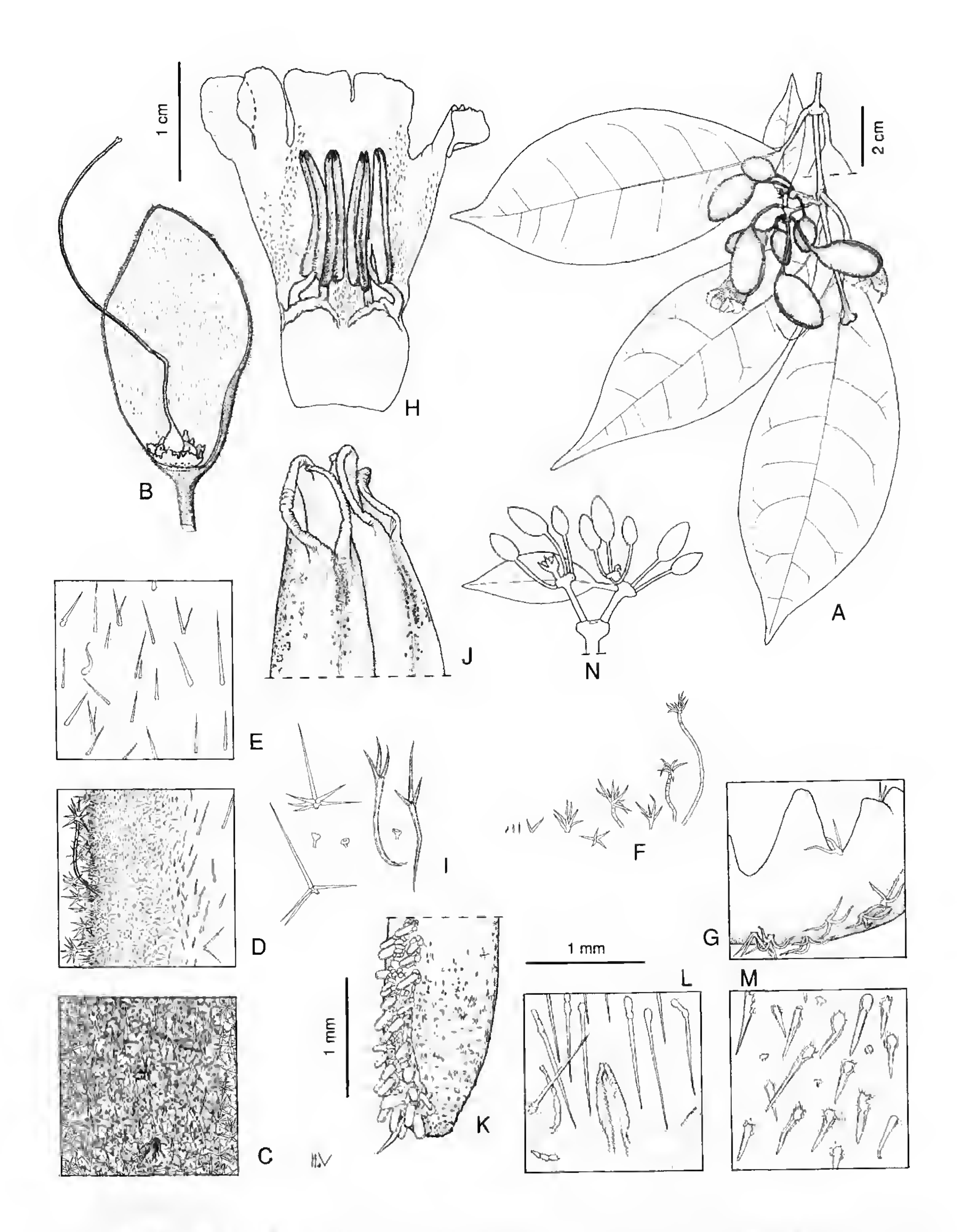


Fig. 5.—***Pseudocalyx saccatus***: **A**, flowering branch; **B**, bracteole inside showing calyx and pistil; **C**, detail indumentum of bracteole outside; **D**, detail of bracteole margin; **E**, detail indumentum bracteole inside; **F**, hairs of bracteole; **G**, detail of calyx; **H**, corolla inside; **I**, hairs of corolla outside; **J**, apical part of anther; **K**, basal part of anther; **L**, staminode; **M**, detail indumentum of corolla inside; **N**, inflorescence schematically. (A-N, *Casier 226*). Drawing by H. DE VRIES.

(K); *Mponda 12692,* Rondo, fl. Nov. (K); *Schlieben 5490,* Muera Plateau, fl. buds Oct. (BR, G, P); *Semsei 722,* Rondo, fl. buds Mar. (K).—ZAMBIA: *Chisumpa 626,* Kasama, fl. buds Mar. (K); *Fanshawe 2386,* Samfya, fl. buds July (K); *Fanshawe 4814,* Wantipa, fr. Sep. (K); *Michelmore 352,* Lake Meru, Chienge Distr., fr. juv. May (K); *Pope & Goyder 2105,* Chinsali, fl. Apr. (BR, K); *Richards 9008,* Wantipa, fl. Apr. (BR, K); *Richards 15291,* Abercorn, fl. June (K) ; *Richards 21360,* Lunzua, fl. buds Mar. (K); *Versey-Fitzgerald 4281,* Lunzuwa R., fl. June (BR, K, WAG).—ZIMBABWE: *Hack 25172,* Chirinda Forest, fl. buds Aug. (K); *Goldsmith 38/61,* Chirinda Forest, Melsetter, fl. buds June (K); *Muller & Pope 3752,* Rusitu R., fl. July (BR); *Swynnerton 97,* Chirinda Forest, fl. May, type of *P. africanus* (K).

NOTES.—I have not been able to distinguish between *P. saccatus*, the type species from Madagascar and *P. africanus* from the mainland of Africa. I have therefore followed BENOIST (1967) who united these two species. The distinguishing characters used earlier (BRETELER 1994), pertaining to the size of the calyx and the length of the corolla did not resist an analysis of a wider range of material. The *P. africanus* material studied originates from a rather wide variation of habitats, ranging from tropical rain forest to savannas and from altitudes of 500 m or less up to ca. 1400 m.

The calyx of *P. saccatus* may be absent or very small in some Madagascar material, but in other specimens from Madagascar it is quite distinct. On the mainland the calyx is always distinct, but very variable in appearance, from distinctly shortly 5-lobed to irregularly dentate, from glabrous or nearly so to densely stellate-hairy. Although the corolla is generally longer in Madagascar specimens than in those of the former *P. africanus*, there is, however, too much overlap to maintain it as a distinguishing character. The ovary is always hairy in material from

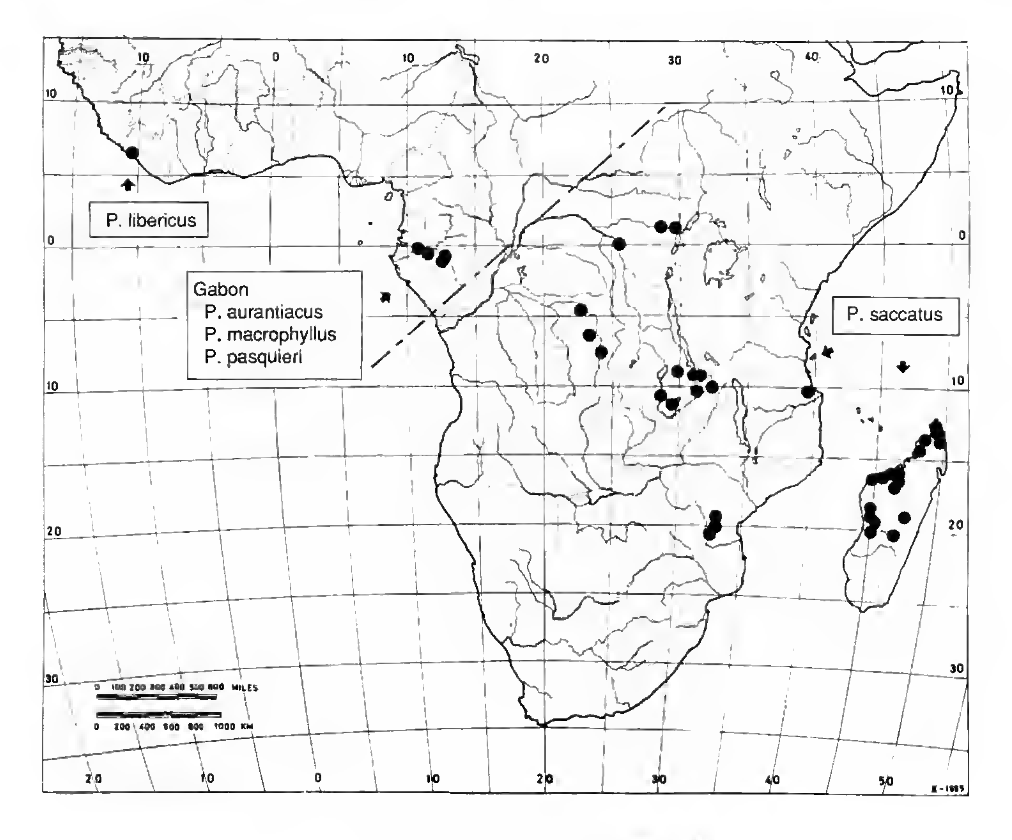


Fig. 6.—Distribution of the five species of ***Pseudocalyx.***

Madagascar, but on the continent is usually glabrous (e.g. hairy in *Malaisse 13833* and in *Schlieben 5490*). The flowers of *Bequaert 1833* have glabrous ovaries, but the same specimen bears fruits which are densely hairy. Apparently this fruit indumentum develops during fructification, at least in some specimens from Africa's mainland.

The original material of *P. saccatus* was, according to RADLKOFER, already quite fragmentary when he described this species. A request at the Bremen herbarium to have it on loan was not successful. It is not known whether it may have been lost at BREM during World War II or may have been "safeguarded" by CSR (see Index Herbariorum, ed. 8: 135, 1990).

Note on the geography of *Pseudocalyx*

The species of *Pseudocalyx* are remarkably distributed, as is shown in Fig. 6. One of them, *P. saccatus*, is widely spread, occurring in Madagascar as well as in a large area on Africa's mainland. The other 4 species are narrow endemics. *Pseudocalyx libericus* is known from a small area in Liberia, in Upper Guinea, while the 3 remaining species occupy a restricted area in Lower Guinea, in Central Gabon. Such a high concentration of species of a small African genus of the Acanthaceae in Gabon, illustrates once more the importance of Gabon's tropical forests in terms of botanical biodiversity. The low number of collections of these 3 Gabonese species, with an average of 3 collections per species, indicates that further exploration of the botanical wealth of this country is still very much needed.

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Manuscript received 16 February 1998;
revised version accepted 26 June 1998.

Contribution à l'étude des Orchidaceae de Madagascar et des Mascareignes. XXVIII

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MOTS CLÉS
Orchidaceae,
Cynorkis,
Madagascar.

RÉSUMÉ
Description de *Cynorkis bardotiana* Bosser, espèce nouvelle du Nord de Madagascar, proche par le port de *C. aphylla* Schltr., mais distinct par la morphologie de la colonne.

KEY WORDS
Orchidaceae,
Cynorkis,
Madagascar.

ABSTRACT
Description of *Cynorkis bardotiana* Bosser, a new species from the north of Madagascar. It is similar in habit to *C. aphylla* Schltr., but differs in the morphology of its column.

Les régions calcaires du Nord et de l'Ouest de Madagascar, massif de l'Ankarana au Nord, tsingy du Bemahara à l'Ouest, de pénétration très difficile, sont loin d'avoir livré tous leurs secrets. Martine BARDOT-VAUCOULON, à partir d'Antsiranana (Diego-Suarez) a pu, depuis plusieurs années, prospecter et faire des récoltes botaniques dans la partie Nord de l'Ankarana. Elle a rassemblé un matériel très varié qui lui a déjà permis de découvrir et de publier des espèces non connues dans différentes familles. Elle a eu la gentillesse de nous confier l'étude d'une Orchidaceae qui s'est révélée très particulière et que nous lui dédions ici.

Cynorkis bardotiana Bosser, **sp. nov.**

Terrestris, erecta, tuberifera, aphylla herba, 12-35 cm alta. Terminales racemi, pauci-pluriflores. Ovato-oblonga sepala, 6-7 mm longa. Linearia petala, 6,5-7,5 mm longa, rotundato apice. Roseum labellum, trilobatum, 12 × 20-22 cm, lateralis lobis grandibus, rotundatis, mediano oblongo, angusto. Filiforme calcar, 2-2,5 cm longum, inflato apice. Rostellum elongata convexa lamina, longiore quam polliniorum caudicula, rotundato vel emarginato apice. Exsertum stigma, ± 2 mm longum.

TYPE. — *Bardot-Vaucoulon 716*, Madagascar, forêt de plateau calcaire, massif de l'Ankarana, Province de Diego-Suarez, 13 juil. 1997 (holo-, P).

Herbe terrestre dressée, aphylle, à 2 tubercules oblongs longs de ± 2 cm. Hampe florale grêle, glabre, ayant à la base 3-4 gaines imbriquées, membraneuses, brunâtres, acuminées, longues de 10-12 mm ; gaines caulinaires 1-2, atteignant 15 mm de longueur. Racèmes terminaux, 2-20-flores, longs de 4-15 cm ; rachis glabre ; bractées lancéolées, atténuées-aiguës au sommet, membraneuses, uninerves, longues de 5-7 mm. Fleurs distantes de 10-15 mm. Sépale médian ovale, aigu, naviculaire, 6-7 × 2,7-2,8 mm, trinervé. Sépales latéraux oblongs, arrondis et un peu cucullés au sommet, trinervés, 7 × 3 mm. Pétales liguliformes, arrondis, au sommet, 6,5-7,5 × 1 mm, uninervés. Labelle trilobé, étalé, 12 × 20-22 mm ; lobes latéraux grands, arrondis longs de 8 mm, larges de 9-10 mm ; lobe médian étroit, liguliforme, long de ± 7 mm, large de 1,5 mm, trinervé, obtus au sommet. Éperon un peu courbe, plus long que l'ovaire pédicellé, long de

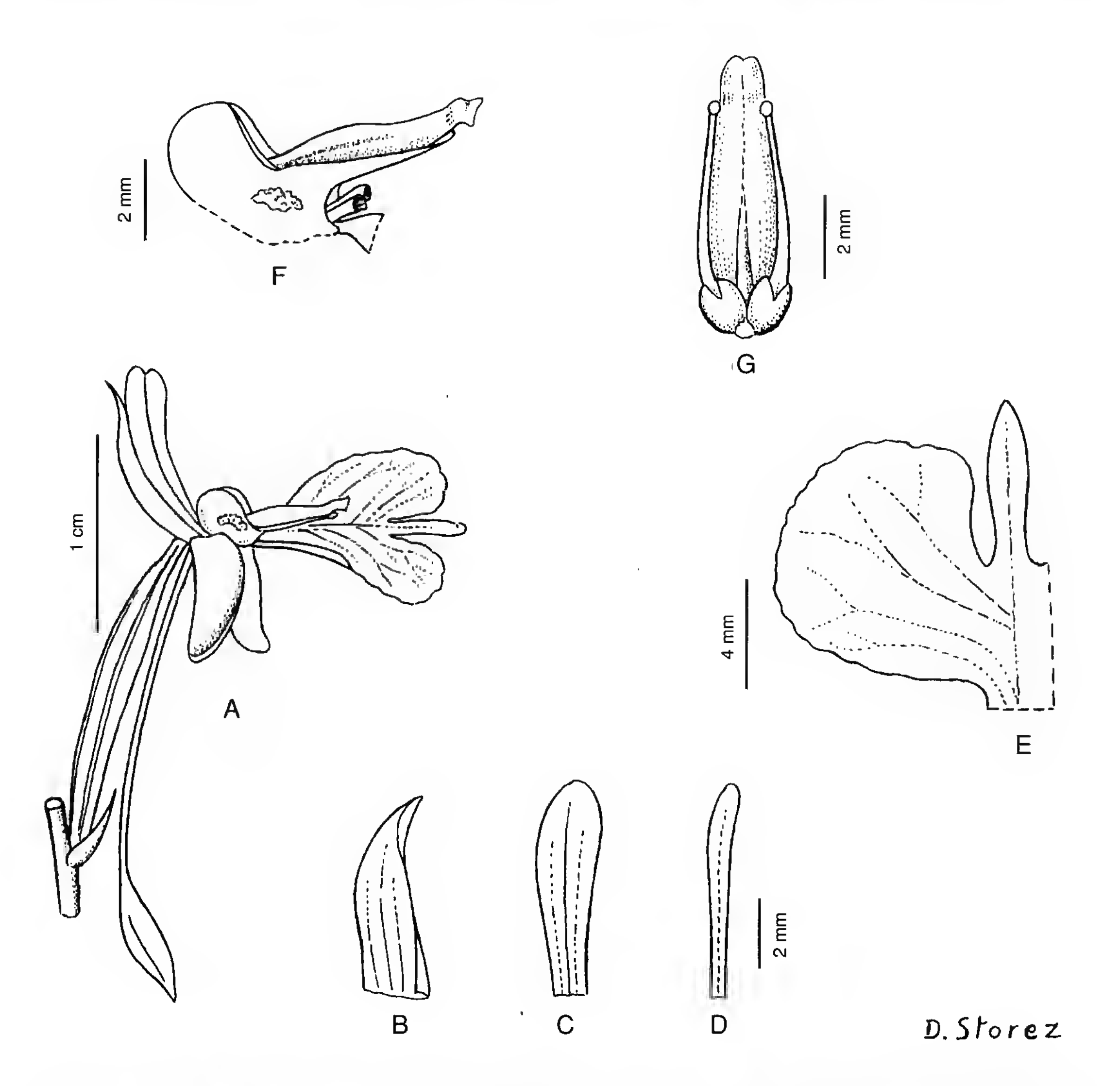


Fig. 1. — ***Cynorkis bardotiana*** : **A**, fleur, profil ; **B**, sépale médian ; **C**, sépale latéral ; **D**, pétale ; **E**, labelle ; **F**, colonne, profil ; **G**, colonne vue du dessus. (A-G, *Bardot-Vaucoulon 716*, P).

2-2,5 cm, filiforme, renflé au sommet en ampoule longue de ± 1 cm amincie vers le sommet obtus. Colonne à rostelle développé en une lame longue de ± 6 mm, convexe, brunâtre, arrondie ou un peu bilobée au sommet ; bras latéraux plus courts et soudés au rostelle. Anthère brune, haute de ± 2 mm ; pollinaires à caudicules longs de ± 3,5 mm ; masses polliniques jaune pâle, pyramidales, hautes de 0,3-0,4 mm ; grains de pollen anguleux ; viscidies punctiformes, blanchâtres. Staminodes représentés par 2 masses granuleuses, blanchâtres, latérales, à la base de l'anthère. Stigmates porrigés, à pied long de ± 2 mm. Ovaire pédicellé glabre, long de 1,3-1,8 cm, à 3 côtes plates, peu en relief.

Espèce de la forêt caducifoliée sur calcaire du Nord de Madagascar, fleurissant en juillet pendant la saison sèche. Il n'y a pas de feuilles développées au moment de la floraison, la plante est peut-être aphylle ou les feuilles se développent plus tardivement. Connue seulement par une récolte.

Par son rostelle en lame horizontale entière au sommet, cette espèce se rattache à la section *Hemiperis* (Frappier ex Cordem.) H. Perrier qui comprend surtout des espèces à petites fleurs bien différentes. Par son port, la taille et la couleur de ses fleurs elle rappelle *C. aphylla* Schltr. appartenant à la section *Lowiorchis* H. Perrier qui se caractérise par un rostelle échancré, à 2 lobes médians, l'un supérieur, l'autre inférieur, très différent du rostelle de *C. bardotiana.*

Remerciements
L'auteur remercie Martine BARDOT-VAUCOULON pour le prêt du matériel, Jacques FLORENCE (ORSTOM) qui a traduit la diagnose latine et Dominique STOREZ qui a réalisé la figure.

Manuscrit reçu le 26 juin 1998 ;
version révisée acceptée le 8 septembre 1998.

A revision of *Campnosperma* (Anacardiaceae) in Madagascar

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ABSTRACT
The genus *Campnosperma* Thwaites (Anacardiaceae) is treated as consisting of four species in Madagascar. Two new species are described, illustrated and compared with *C. micranteium* Marchand, the only species described in the Flore de Madagascar, and the recently described *C. parvifolium* J.S. Miller & Randrianasolo. A key and descriptions are provided and distribution, habitat and phenology are also discussed. *Campnosperma lepidotum* is distinguished by its leaf undersurface covered with overlapping lepidote scales, and *C. schatzii* is marked by its relatively long pedicel and smaller leaf size.

KEY WORDS
Campnosperma,
Anacardiaceae,
lepidote scales,
Madagascar.

RÉSUMÉ
Le genre *Campnosperma* Thwaites (Anacardiaceae) comprend quatre espèces à Madagascar. Deux nouvelles espèces sont décrites, illustrées et comparées à *C. micranteium* Marchand, la seule espèce du genre décrite dans la Flore de Madagascar, et à *C. parvifolium* J.S. Miller & Randrianasolo, une espèce récemment décrite. Une clé de détermination, les descriptions des espèces, ainsi que des informations sur leurs distribution, habitat et phénologie, sont données. *Campnosperma lepidotum* se distingue par la surface inférieure des feuilles couverte d'écailles lepidotes superposées, et *C. schatzii* se différencie par le pédicelle de la fleur qui est relativement long et ses feuilles qui sont de petite taille.

MOTS CLÉS
Campnosperma,
Anacardiaceae,
écailles lépidotes,
Madagascar.

The genus *Campnosperma* comprises 10 species of trees and shrubs, with six occurring in tropical Asia and one each reported from Madagascar, the Seychelles, Panama, and Brazil. Only a single species of *Campnosperma* was reported in the Flore de Madagascar (PERRIER DE LA BÂTHIE 1946), although a second Malagasy species was recently described from the Marojejy massif (MILLER & RANDRIANASOLO 1998). The reexamination of numerous botanical collections made since the preparation of PERRIER DE LA BÂTHIE's (1946) treatment indicates that the Malagasy populations of *Campnosperma* are best treated as four morphologically distinct species. Two of these are newly described. *Campnosperma* species are usually large canopy trees, and can occupy a diverse type of habitats, swamps to forests on well drained soils, ranging from sea level to ca. 1600 m (DING HOU 1978). The Malagasy species are distributed from the wet and sandy eastern coastal forests at sea level to premontane and montane rainforests up to 1700 m.

Campnosperma species are trees, with simple, entire, petioled, spiral leaves which on both surfaces very often have minute, peltate or lobed scales. They have axillary, paniculiform inflorescences with unisexual or bisexual flowers. Their most distinctive characters in the family are the number of stamens which is twice the number of petals with the epipetalous ones shorter than those alternipetalous, and the incomplete 2-celled ovary which when developed to fruit has very hard and bony endocarp and curved seed (DING HOU 1978).

CAMPNOSPERMA Thwaites

Hooker's J. Bot. Kew Gard. Misc. 6: 65 (1854).

TYPE.—*Campnosperma zeylanicum* Thwaites.

Key to the Malagasy species of *Campnosperma*

1. Leaves less than 7 cm long and 3.3 cm wide; shrubs or trees of high elevation (ca. 900 m-1800 m) .... ***C. parvifolium***
1'. Most of the leaves greater than 7 cm long and 3.3 cm wide; trees of low to mid-elevation (sea level ca. 1200 m) 2
2. Leaves with a dense layer of lepidote scales completely concealing the lower leaf surface or nearly so .... ***C. lepidotum***
2'. Leaves with lepidote scales below, but not forming a dense, continuous layer 3
3. Pedicels glabrous, 0.8-2 mm long; leaves 4.5-14.5 cm long, 1.5-5.5 cm wide .... ***C. schatzii***
3'. Pedicels pubescent, 0.3-0.5 mm long; leaves 11-25 cm long, 4-9 cm wide .... ***C. micranteium***

Campnosperma lepidotum Capuron ex Randrianasolo & J.S. Miller, **sp. nov.**

Haec species a congeneris madagascariensibus similis sed ab eis lamina foliari subtus sqamis lepidotis imbricatis obtecta differt.

TYPE.—*SF 8702, Capuron*, Madagascar, Antsiranana, forêt orientale (limite supérieure): Massif de l'Ambohitsitondroina à l'est de Mahalevona (NW de la presqu'île Masoala), ca. 900 m, 4 Dec. 1953, fl., yg. fr. (holo-, P; iso-, MO, TEF).

Functionally dioecious trees, 15-30 m tall, the young branches glabrous. The leaves simple, persistent, coriaceous, very often clustered at the end of branches; blades obovate, 10-21.5 cm long, 4.4-10 cm wide, the apex somewhat rounded or emarginate, the base decurrent cuneate, the margin entire, slightly revolute; the adaxial surface glabrous and very sparsely lepidote, the abaxial surface covered completely with lepidote scales forming a distinct maroon layer, the venation pinnate, brochidodromous, prominent below especially the midvein, the secondary veins more or less parallel, more perpendicular to the midvein toward the leaf base; petioles 0.8-14 mm, canaliculate on the adaxial surface, waxy, lepidotic and with very sparse hairs.

Inflorescence a subterminal paniculiform raceme, borne in the very upper leaf axils, 3.5-19 cm long, the branches densely lepidotic with sparse stellate hairs, each flower subtended by a deltoid bract, 0.5-0.6 mm long, 0.5-0.6 mm wide. Flowers morphologically bisexual but apparently functionally unisexual, small, pedicels 0.5-0.8 mm long; sepals 4, shallowly deltate, valvate, 0.7-1 mm long, 1-1.2 mm broad, glabrous or glabrescent on outside; petals 4, ovate, imbricate, 1.2-2 mm long, 1-1.2 mm wide, glabrous; stamens 8, 4 alternipetalous and 4 epipetalous, 0.7-1.5 mm and 0.5-0.8 mm respectively in male flowers, much shorter and sterile in female flowers, inserted basally on the outer surface of the disk, flattened and broadened at the base, the anthers ovate, basifixed, introrse, with longitudinal slits, 0.2-0.5 mm long; disk more annular and cupiliform in female flower, dish-shaped and crenulate in male flowers; ovary asymmetric, densely lepidotic, widely ovate to widely depressed ovate, 0.5-0.8 mm long, 0.3-0.5 mm wide, very reduced and sterile in male flowers, the style very short or obscure, the stigma subdiscoidal.

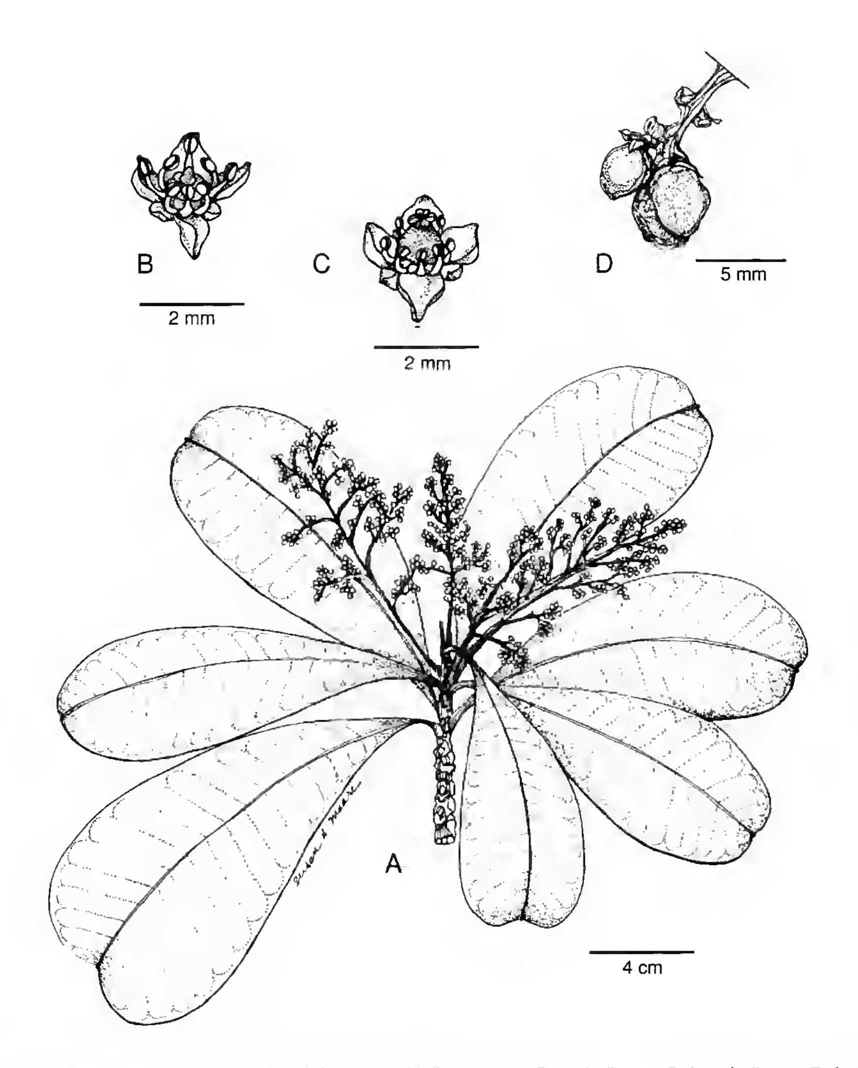


Fig. 1.—***Campnosperma lepidotum***: **A**, branch with leaves and inflorescence; **B**, male flower; **C**, female flower; **D**, fruits.

Young drupes covered with lepidote scales, incompletely 2 celled filled by a single curved embryo, endocarp very hard.—Fig. 1.

ECOLOGY, PHENOLOGY AND DISTRIBUTION.—This species occurs in northeastern Madagascar, in rainforest between 900 and 1150 m elevation, where precipitation can be high as 2000 mm per year. It has been collected in flower in December and early January.

The genus *Campnosperma* is characterized by the presence of scales on their surfaces (DING HOU 1978). This species differs markedly from the other *Campnosperma* species by the undersurface of the leaves being densely covered by overlapping lepidote scales (Fig. 2B). It is similar to *C. micranteium* in leaf size, inflorescence pattern and floral characters, however, this latter has much fewer and widely spaced lepidote scales.

PARATYPES.—MADAGASCAR: *Cours 3668*, Antsiranana: au pied de l'Anjanaharibe, 850 m, 16 Dec. 1950, yg. fr. (P, TAN, TEF); *Cours 4777*, Itinéraire de Didy à Brickaville, fl. (MO, P); *Humbert et al. 24532, 24591*, massif de l'Anjanaharibe (pentes et sommet Nord) à l'ouest d'Andapa (haute Andramonta, bassin de la Lokoho: Nord-Est), forêt ombrophile sur gneiss et granite, 14°40'S, 49°31'E, 900 m, 10 Dec. 1950-3 Jan. 1951, yg. fr. (MO, P); *SF 925, Capuron*, massif de l'Anjanaharibe (W district Andapa), Campement n° 2, 900 m, 16 Dec. 1950, yg. fr. (MO, P, TAN, TEF); *SF 925bis, Capuron*, est (confins de centre): massif de l'Anjanaharibe, à l'ouest d'Andapa, 900 m, 16 Dec. 1950, yg. fr. (MO, P, TAN, TEF); *SF 8719, 8720, Capuron*, forêt orientale de cimes: massif de l' Ambohitsitondroina de Mahalevona (NW de la presqu'île Masoala), vers 1100-1200 m, fl. and fr. (P, TAN, TEF); *SF 8856, Capuron*, forêt orientale, à sa limite supérieure: massif de Beanjada (au Nord de la presqu'île Masoala), 1150 m, 3 Jan. 1954, fl. (MO, P-2 sheets, TAN, TEF).

Campnosperma micranteium Marchand

Des Térébinthacées et de ceux de leurs produits qui sont utilisés en pharmacie: 175 (1869); A. Grandidier, Hist. Nat. Mad., Bot. Atlas II, t. 231 (1886).—Type: *Boivin s.n*, Madagascar, Toamasina: Sainte Marie, 9 Oct. 1850, fl. (holo-, P!).

Functionally dioecious trees 10-25 m tall, young twigs waxy, glabrous, sometimes with lenticels. The leaves simple, persistent, coriaceous; blades obovate or oblanceolate, 11-25 cm long, 4-9 cm wide, the apex emarginate, retuse or rounded, the base decurrent cuneate, the margin entire and revolute, the adaxial surface glabrous, the abaxial surface with evenly distributed lepidote scales, the venation pinnate, brochidodromous, the midvein prominent undersurface; petioles 3-7 mm, shallowly channeled, glabrous.

Inflorescence an axillary or subterminal raceme paniculiform, clustered at the very end of branches (as well as the leaves sometimes), 9-20 cm long, covered densely with stellate hairs mixed with sparse lepidote scales, each flower subtended by a deltoid to shallowlly triangular bract, ca. 1 mm long and 0.5-1 mm wide. Flowers morphologically bisexual but functionally unisexual, very small ca. 1.5 mm long, pedicels 0.3-0.5(-1) mm long, glabrous; sepals 4, deltate, triangular or depressed ovate, valvate, glabrous, 0.5-0.6 mm long and 0.5-1 mm wide; petals 4, ovate, imbricate, glabrous, 1-1.5 mm long, 0.5-1 mm wide; stamens 8, 4 alternipetalous greater in size, 4 alternisepalous much shorter, 0.8-1 mm and 0.5 mm long respectively in male flowers, staminodes ca. 0.8-1 mm long in female flowers, the filaments flattened and broader at the base, the anthers ovate or subglobose, basifixed, introrse, opened with longitudinal slits, 0.3-0.5 mm long; disk dish-shaped, cranulate, ca. 1 mm of diameter in male flowers, annular, cupiliform, edge crenulate, ca. 1-1.5 mm in diameter in female flowers; ovary rudimentary in male but ovate, very slightly asymmetric, 1-1.2 mm long, 0.8-1 mm broad, covered with lepidote scales in female; the style very short ca. 0.2 mm long, almost terminal; the stigma subdiscoidal variously lobed.

Very young drupes covered with lepidote and still bearing a subdiscoidal stigma, mature fruits slightly asymetric, widely ellipsoidal, ca. 1 cm long and ca. 0.8 cm broad, with less lepidote scales outside, incompletely divided into two cells, filled by a single curved seed, endocarp hard.

ECOLOGY, PHENOLOGY AND DISTRIBUTION.—This species occupies similar habitat much like of that *C. schatzii* but more restricted to lower elevation (up only to ca. 600 m) where *C. schatzii* ranges up to ca. 1000 m nearby Moramanga.

Campnosperma micranteium usually flowers from October to January but also recorded with flowers in April and August, and fruits from October to February.

Campnosperma micranteium has leaves large as those of *C. lepidotum*, but differs from the latter by its spaced, smaller-sized lepidote scales on the undersurface (Fig. 2A). This species is distin-

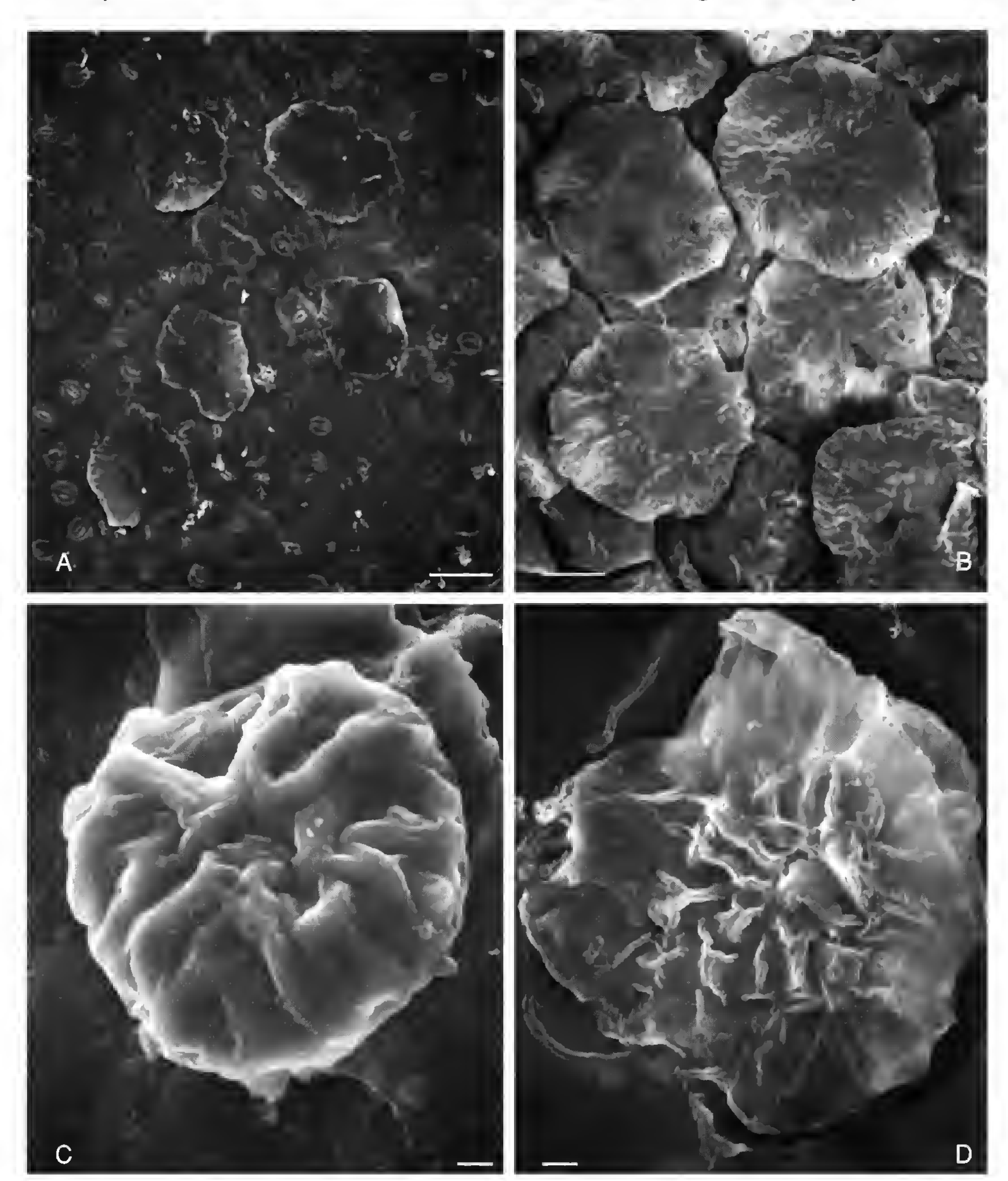


Fig. 2.—Scanning Electron micrographs of lower leaf surface of Malagasy ***Campnosperm**a* species: **A**, ***C. micranteium***, scattered lepidote scales on lower leaf surface (*Humbert 24414*, MO), scale bar = 50 µm; **B, *C. lepidotum***, overlapping lepidote scales on lower leaf surface (*Humbert 24535*, MO), scale bar = 50 µm; **C, *C. schatzii***, individual lepidote scales (*Schatz et al. 3419*, MO), scale bar = 5 µm; **D, *C. parvifolium***, individual lepidote scales (*Miller & Randrianasolo 4423*, MO), scale bar = 5 µm.

guished from *C. schatzii* by its relatively short pedicel (0.3-0.5 mm (rarely 1 mm) long versus 0.8-2 mm long).

One population from Fort-Dauphin (*SF 3352, Capuron*) differs from the typical *C. micranteium* in its smaller leaf size and further study and additional collections may prove it to represent an additional distinct taxon.

MATERIAL EXAMINED.—MADAGASCAR: *Humbert 24414*, environs de Sambava (Cote Nord-Est), bois littoraux sur sables, marais à Raphia, 14°15'S, 50°09'E, 1-5 m, 28 Nov.-3 Dec. 1950, yg. fr. (MO, P); *Humblot 462*, 28 Jan. 1885, fl. (MO, P-2 sheets); *M. de Lastelle s.n.*, no locality, fl. (P); *Perrier de la Bâthie 3002*, Maroantsetra, Bois Côte Est, Aug. 1912, fl. (P); *96 R 233*, forêt Andriantantely, Amboditavolo, canton Lohariandava, district Brickaville, 600 m, 22 Aug. 54, fl. buds (MO); *RN 4528, Rakotoniaina*, Ambodiarana, district Toamasina, 11 Dec. 1952, fl. (P-2 sheets, TAN, TEF); *RN 5341, Rakotoniaina*, Ambodiriana, district Toamasina, 12 Feb. 1953, fr. (MO, P); *RN 6927, Alfred Martin*, Ambodiriana, district Toamasina, 6 Jan. 1955, fl. (P, TAN, TEF); *RN 7703, Rakoto Jean de la Croix*, Angoedro, district Toamasina, 21 Oct. 1955, fl. (P, TEF); *SF 887bis, Capuron*, Raphières à Antongompahatra (au N de Sambava), 1 Dec. 1950, yg. fr. (P); *SF 3352*, Mandena, Fort-Dauphin, 5 Apr.1951, fl. (MO, P-2 sheets, TAN, TEF); *SF 7980*, Piste Anosibe, Moramanga, fl. (MO, P, TAN, TEF); *SF 9013, Capuron*, forêts orientales: environs du col d'Antandrokolaka (entre Amboditavolo, bassin de la Fanenahana, et Morafeno, bassin de la Rantabe), Maroantsetra, 400 m, fr. (P, TAN, TEF); *SF 11473, Capuron*, Sambirano: Massif du Manongarivo, escarpements dominant la rive gauche de la basse Antsahankolana, à l'Est d'Analalantsoa, Nov. 1954, fl. (P-2 sheets, TAN, TEF); *SF 14177, Capuron*, Tampolo Fénérive-Est, 28 May 1955, fr. (P, TAN, TEF); *SF 19810*, Fianarantsoa: Ambolomboro, Canton Ankarimbelo, district Fort-Carnot, sur une pente exposition ouest à Vohimampay, 25 Oct. 1960, fr. (P, TAN, TEF).

Campnosperma parvifolium Capuron ex J.S. Miller & Randrianasolo

Novon 8: 170 (1998).—Type: *Miller et al. 3529*, Madagascar, Antsiranana: Réserve Naturelle Marojejy, along the trail to the summit of Marojejy Est, below the third camp, lichen forest and exposed wind-swept ridges, 1100-1300 m, 14°26'S, 49°15'E, 10 Oct. 1988, fl. (holo-, MO; iso-, G, K, NY, P, TAN, TEF, US).

Shrub or small tree (2-)10-12 m tall, the young twigs densely covered with a mixture of lepidote scales and stellate hairs, later glabrescent and smooth or somewhat waxy. The leaves persistent, coriaceous; blades elliptic to obovate, (1.4-)2-6.7 cm long, (0.9-)1.5-3.3 cm wide, the apex retuse to rounded, the base obtuse to cuneate, sometimes briefly decurrent along the petiole for ca. 1-2 mm, the margin strongly revolute, entire, the adaxial surface glabrous, waxy, and lustrous, sometimes sparsely lepidote, the abaxial surface glabrous or occasionally with sparse stellate hairs, evenly lepidote (appearing gland-dotted), but the scales not overlapping, the venation brochidodromous, prominent and raised on both surfaces, the secondary veins 5-9, parallel, often only slightly more prominent than the dense reticulum of tertiary veins on the lower surface; petioles 3-8 mm long, stout, canaliculate on the adaxial surface, lepidote to densely stellate-pubescent.

Inflorescences borne in the upper leaf axils, sparsely-branched panicles or racemes (1-)3.3-6.3 cm long, the branches evenly to densely lepidote to stellate, each flower subtended by a triangular bract 0.5-1 mm long. Flowers functionally unisexual (the plants dioecious), small, on pedicels 0.5-1.5 mm long, ca. 1 mm in diameter; sepals 4, imbricate, deltate, ca. 0.5 mm long, lepidote; petals 4, imbricate, broadly elliptic, 1.5-2 mm long, ca. 1 mm wide, glabrous or with an occasional lepidote scale on the exterior surface; stamens 8, the filaments inserted at the base of the disk, flattened and broader at the base, ca. 0.5 mm long, the anthers ca. 0.2 mm long; nectariferous disk annular and unevenly lobed; ovary ovoid, small and partially immersed in the annular disk, the stigma subdiscoidal.

Fruit drupaceous, broadly ellipsoid, 7-8 mm long, 5-6 mm broad, glabrous.

ECOLOGY, PHENOLOGY AND DISTRIBUTION.—This species occurs in cloud forests of Northeastern Madagascar, at 900 m and up. It is known only from the Marojejy massif and several nearby mountains of NE Madagascar, where it is often quite abundant on open, high-elevation, wind-swept ridges. It flowers in October-November and sets fruits in December.

Campnosperma parvifolium differs from the other species of the genus in Madagascar in its much smaller leaves, smaller number of secondary veins, and lower leaf surface with scattered, small lepidote scales (Fig. 2D). It also has the smallest flowers of any of the Madagascar species in the genus.

MATERIAL EXAMINED.—MADAGASCAR: *Deroin & Badré 40*, Marojejy RNI 12, rive gauche de la Manantenina, versant sud de Beondroka, sylve à lichens, 14°25'S, 49°50'E, 1040 m, 12 Nov. 1989, fl. (MO, P); *Humbert et al. 24783*, Antsiranana: massif de l'Anjanaharibe (pentes et Sommet Nord) à l'ouest d'Andapa, sylve à lichens, 14°40'S, 49°26'E, 1600-1800 m, 10 Dec. 1950 - 3 Jan. 1951, yg. fr. (P); *Miller & Randrianasolo 4473*, Réserve Naturelle de Marojejy, western slopes and summit of Mt. Beondroka, lichen forest and open wind-swept ridges, 830-1210 m, 14°27'S, 49°47'E, 26 Oct. 1989, fl. (MO, TAN); *Miller & Randrianasolo 4683*, Réserve Naturelle de Marojejy, along the trail to the summit of Marojejy Est, N of Mandena, premontane forest, lichen forest, and exposed wind-swept ridges below the 3rd camp, 900-1300 m, 14°26'S, 49°46'E (MO, P, TAN); *Rakotomalaza et al. 871*, Réserve Naturelle Intégrale de Marojejy, 10.5 km NW of Manantenina, along tributary at head of Andranomifotra River, Campement 4, 1625 m, 14°26'24"S, 49°44'30"E (MO, P, TAN); *Rasoavimbahoaka 144* (MO, P, TAN); *SF 936, Capuron*, massif de l'Anjanaharibe (W d'Andapa), 1600 m, 23 Dec. 1950, yg. fr. (P- 2 sheets, TEF).

Campnosperma schatzii Randrianasolo & J.S. Miller, **sp. nov.**

Haec species a congeneris madagascariensibus pedicello sat longo (0.8-2 mm) et foliis parvis (4.5-14.5 cm longis, 1.5-5.5 cm latis) distinguitur.

TYPE.—*Schatz et al. 3619*, Madagascar, Toamasina: Station Forestière Tampolo, 9 km N of Fénérive-Est. Plot 2. 17°17'15"S, 49°25'11"E, 27 Nov. 1994, fl. (holo-, MO; iso-, P, TAN).

Functionally dioecious trees, 5-12 m tall, young twigs waxy. The leaves simple, persistent, coriaceous, blades obovate to elliptic or oblanceolate to oblong, 4.5-14.5 cm long, 1.5-5.5 cm wide, the apex emarginate or retuse or rounded, the base decurrent cuneate, the margin entire, slightly revolute, the adaxial surface sparsely covered with lepidote scales, or waxy, glabrous, the abaxial surface more densely covered with lepidote scales than the upper surface, also glabrous, the venation pinnate, brochidodromous, prominent undersurface, the secondary veins more or less parallel, sometimes more obtuse toward the leaf base; petioles (0.3-)0.5-1 cm long, shallowly canaliculate, with lepidote and stellate hairs when young, glabrescent or glabrous when mature.

Inflorescence an axillary raceme paniculiform at the very end of branches, 4-14 cm long, the branches very often covered with lepidote scales and stellate hairs, sometimes glabrous, each flower subtended by a small triangular bract, ca. 1 mm long and 0.5 mm broad. Flowers functionally unisexual, small, pedicel 0.8-2 mm long, ca. 0.4 mm in diameter, sometimes few sparse lepidote scales on its surface; sepals 4, deltate, valvate, 0.5-1 mm long, 0.5-1 mm wide, sometimes sparsely lepidote on the exterior surface otherwise glabrous; petals 4, ovate, imbricate, 1-1.5 mm long, 0.8-1 mm wide, glabrous; stamens 8, 4 alternipetalous and 4 epipetalous much shorter, 0.8-1 mm and ca. 0.5 mm long respectively in male flowers, much shorter and sterile in female flowers, inserted at the base of outer surface of the disk, the filaments flattened and broader at the base, the anthers subglobose ovoid, basifixed, introrse, with longitudinal slits, 0.2-0.4 mm long; disk more annular and cup-shaped in female flowers, ca. 0.5 mm high, cranulate, shallowly dish-shaped and also cranulate in male flowers; ovary depressed ovate, asymmetric, ca. 0.7-0.8 mm long and ca. 1 mm broad, densely lepidote, very reduced and sterile in male flowers, the style very short, the stigma four lobed and diffuse.

Drupes very widely ovate, 5.5-8 mm long, 5-8 mm broad, covered with lepidote scales, incompletely 2-celled filled by a single curved embryo or seed, hard endocarp.—Fig. 3.

ECOLOGY, PHENOLOGY AND DISTRIBUTION.—This species occurs in a wide range of habitat from sea level to 1200 m. It is distributed from wet sandy coastal littoral forests to highland premontane rainforests. It has been collected in flower between October and December, and in fruit between December to February.

This species is distinguished by its relatively

long pedicel (0.8-2 mm). Compared to *C. lepidotum* and *C. micranteium* its leaf size is much smaller (4.5-14.5 cm), and it differs from *C. parvifolium* in the length of the decurrency of its leaf base (1-2 mm in *C. parvifolium* vs. 5-10 mm in *C. schatzii*). The lower leaf surface of this new species seemingly has similar sized lepidote scales as *C. micranteium*, but they are fewer in number, and thus more widely spaced (Fig. 2C). *C. schatzii* is named in honor of George E. SCHATZ, whose

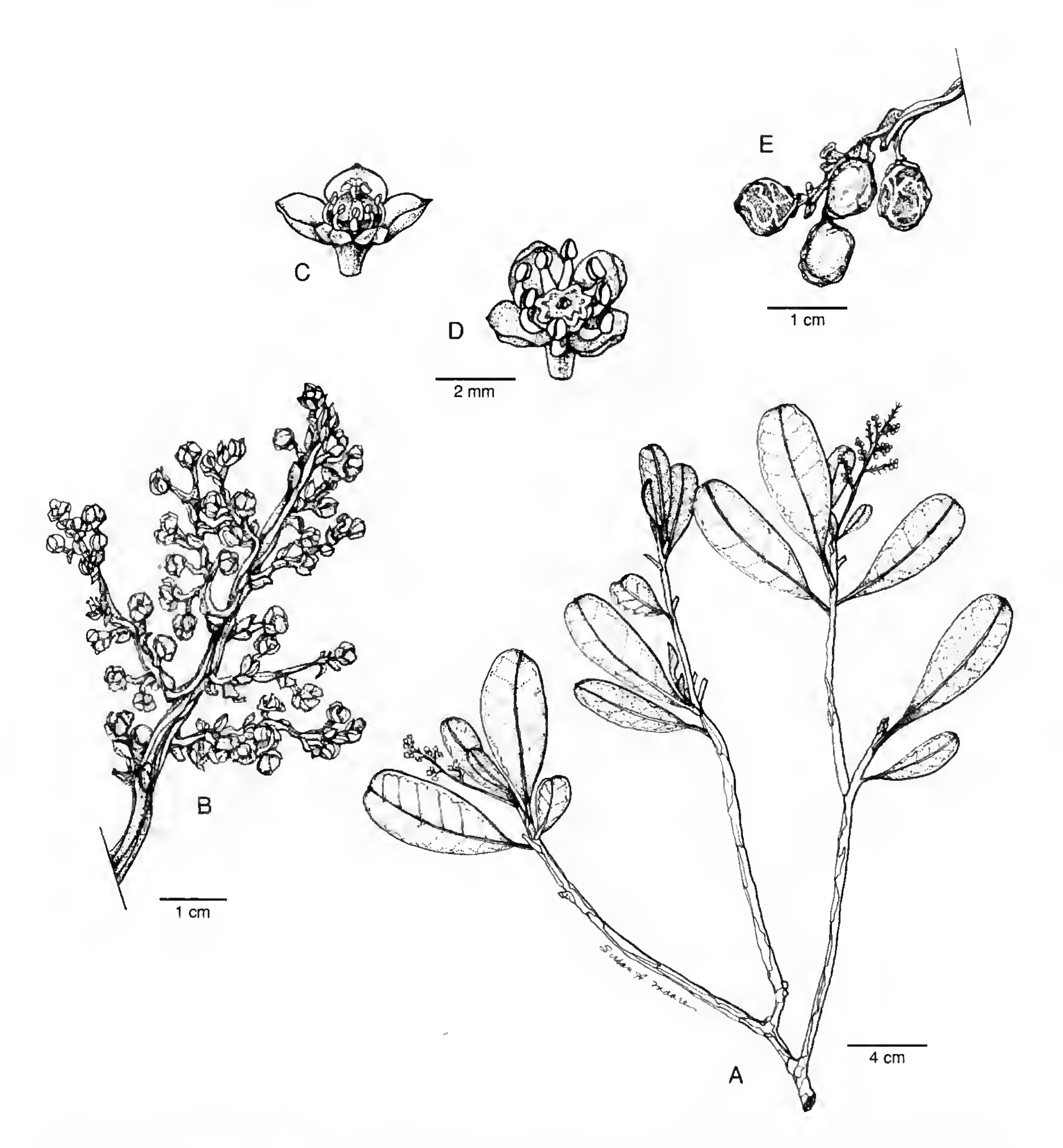


Fig. 3.—***Campnosperma schatzii***: **A**, branch with leaves and inflorescence; **B**, inflorescence; **C**, female flower; **D**, male flower; **E**, fruits.

collections and work on the flora of Madagascar have added greatly to our present knowledge.

PARATYPES.—MADAGASCAR: *Louvel 38*, Toamasina: Tampina, forêt littorale orientale, 25 Oct., fl. (P); *Louvel 51*, forêts côtières de l'Est, fl. (P); *McPherson 16545*, near Andasibe, forest of Mantadia, beyond graphite mine, on ridge above road from km 14, 18°55'S, 48"25'E, 1200 m, 8 Nov. 1994, fl. (MO, P, TAN); *RN 8064*, Antsiranana: Antalaha, Ambohitralanana, 15 Dec. 1956, fl. (P, TAN, TEF); *SF 4269*, Fénérive-Est, Tampolo, 27 Nov. 1951, fl. (P, TAN, TEF); *SF 6462*, Tampina - Ambila Lemaitso, 27 Dec. 1952, fr. (P, TAN, TEF); *SF 8979, Capuron*, forêt orientale: bassin de la Fananehana, massif de l'Androna, vers 600 m, fr. (P-2 sheets, TAN, TEF); *SF 9039, Capuron*, forêt orientale: environs du col d'Antandrokolaka, (entre Amboditavolo, bassin de la Fananehana et Morafeno, bassin de la Rantabe), vers 550 m, fr. (P, TAN, TEF); *SF 11448, Capuron*, Centre: massif du Manongarivo: Bekolosy, vers 1200 m, 13 Nov. 1954, (P-2 sheets, TAN, TEF); *SF 12478*, Tampolo, Canton Ampasina, district Fénérive Est, 3 m, 13 Nov. 1954, fl. (P-2 sheets, TAN, TEF); *SF 17816*, Jardin Botanique n°21 Tampolo, Fénérive Est, 3 m, 3 Dec. 1957, fl. (P, TAN, TEF); *SF 22106, Capuron*, Est: forêt de Mangalimaso (sur latérite), à l'ouest de Foulpointe, 23 Nov. 1962, fl. (P, TAN, TEF); *SF 26820, Capuron*, Ankazomanitra, PK 45 Moramanga Anosibe, Canton Anosibe, district Moramanga, forêt sèche, 9 Nov. 1968, fl. (MO, P, TAN, TEF); *SF 28156, Capuron*, Est: massif boisé de Marozevo (Beforona), 23 Jan. 1968, fr. (MO, P, TAN, TEF); *SF 28463, Capuron*, Est (confins du Centre): forêt à mousses et sous-bois herbacé aux environs ouest du village d'Antanandava (P.K. 45 de la route Moramanga-Anosibe), Nov. 1968, fl. (MO, P, TAN, TEF); *Thouars s.n.*, no locality, sterile (P).

Acknowledgement

George SCHATZ was the first to point out the problems with the taxonomy of *Campnosperma* in Madagascar and we thank him for his input. We also thank Simon MALCOMBER for his valuable comments, Roy GEREAU for providing the latin description, Mary MERELLO for her help with the SEM work, and to Susan A. MOORE for the illustrations. We are grateful to the staff of the Laboratoire de Phanérogamie, Muséum National d'Histoire Naturelle, Paris, for making specimens available for study, both by loan and during visits.

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Manuscript received 26 August 1997; revised version accepted 26 June 1998.

Passiflora aimae (Passifloraceae), une espèce nouvelle de Guyane française

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MOTS CLÉS
Guyane française,
Passiflora,
Passifloraceae.

RÉSUMÉ
Une espèce nouvelle de *Passiflora* subg. *Passiflora*, *P. aimae* Annonay & Feuillet, est décrite de Guyane française. Elle est proche de *P. coccinea* Aubl., dont elle diffère par des bractées beaucoup plus réduites et des feuilles crénelées.

KEY WORDS
French Guiana,
Passiflora,
Passifloraceae.

ABSTRACT
Passiflora aimae Annonay & Feuillet, a new species from French Guiana, is described in subg. *Passiflora*. This species is related to *P. coccinea* Aubl. from which it differs by its crenate leaves and much shorter bracts.

Un *Passiflora* nouveau a été découvert et récolté en Guyane française le long de la Piste de Saint-Élie près de Sinnamary (H.A., 1998, fl.) et au pied de la Montagne des Nouragues dans le Bassin de l'Arataye (C.F., 1987, st.). Ce nouveau taxon appartient au groupe d'espèces à fleurs rouges (dont fait partie *P. coccinea* Aublet) que KILLIP (1938) plaçait dans le sous-genre *Distephana* (Juss.) Killip, mais que FEUILLET & MACDOUGAL (inéd., révision en cours) rattachent au sous-genre *Passiflora*.

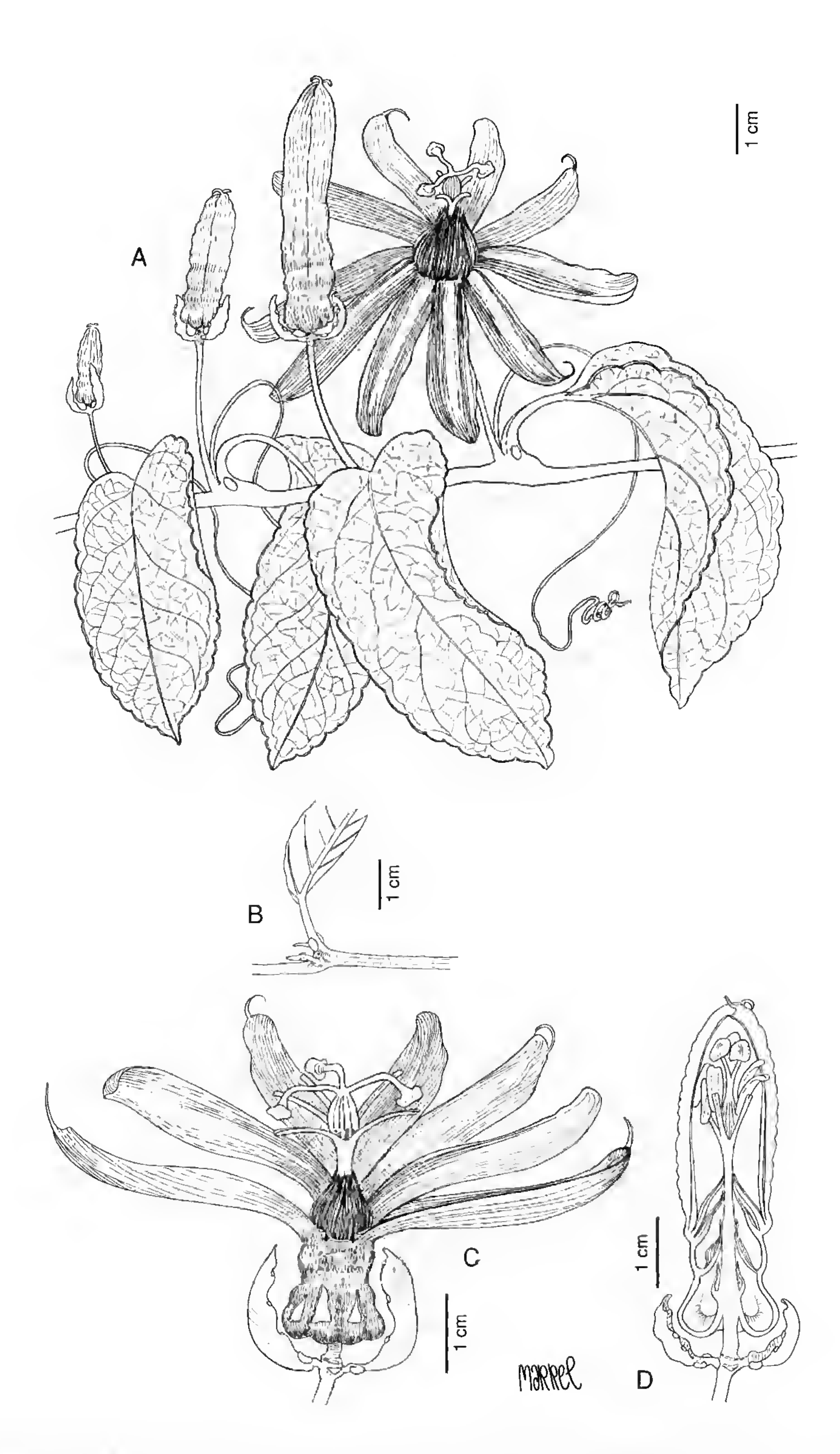


Fig. 1. — ***Passiflora aimae*** Annonay & Feuillet : **A**, rameau fleuri ; **B**, stipules et glandes pétiolaires ; **C**, fleur montrant les ouvertures pratiquées par les fourmis à la base du tube ; **D**, bouton floral en coupe longitudinale. (*Annonay 2*).



Fig. 2. — **Passiflora aimae** Annonay & Feuillet. (Photo H. ANNONAY).

Passiflora aimae Annonay & Feuillet, **sp. nov.**

Species haec in subg. Passiflora *pertinens ; folia margine crenata glandulosa ; stipulae anguste triangulares biglandulosae ; bracteae involucratae librae serratae foliaceae incarnatae glandulosae ; sepala et petala rubra.*

TYPE. — *Annonay 2*, Guyane Française, région de Sinnamary, Piste de St.-Elie, environ 120 km WNW de Cayenne, 5°20'N, 53°00'W, 10-50 m, 4 mars 1998 (holo-, US ; iso-, CAY, P).

Liane ligneuse atteignant 4-5 m de hauteur, ou plus ; jeunes vrilles violettes devenant brun rouge. Feuilles simples, alternes ; stipules étroitement triangulaires à linéaires, section transversale presque ronde, portant une paire de glandes latérales environ à la moitié de leur longueur, rouge violet, rapidement caduques ; pétiole long d'env. 2 cm, canaliculé, ayant une paire de glandes à la base et parfois une seconde paire entre le milieu et l'apex ; glandes sessiles, hémisphériques, 2 × 2 × 2 mm, vert jaunâtre violacé ; limbe largement elliptique, 8-15 × 3-8 cm, brièvement acuminé, à marge crénelée, glanduleuse dans les indentations, obtus à arrondi à la base, 4-5 paires de nervures principales, face supérieure vert moyen à foncé, brillante, glabre, face inférieure vert blanchâtre, pubescente, avec les nervures violettes, les deux moitiés formant un angle d'environ 45° autour de la nervure médiane courbée.

Fleurs axillaires, solitaires, placées au-dessus du feuillage par le pédoncule dressé, long de 4-5 cm ; 3 bractées (1 bractée et 2 bractéoles) verticillées, placées immédiatement sous la fleur et entourant le tube floral, oblongues-elliptiques, environ 1,3 × 0,4 cm, aiguës à l'apex, portant généralement 3 paires de glandes marginales, rouges ; tube floral rouge jaunâtre à rouge vif à peine plus long que large, 1,7 × 1,6 cm, à base dilatée et 10-lobée ; sépales oblongs à linéaires-oblongs, de la même couleur que le tube, 4-4,2 × 1-1,5 cm, avec un éperon subterminal long de 3-5 mm ; pétales rouge vif, de la même taille que les sépales, sans éperon ; couronne à 2 verticilles, l'extérieur à filaments libres, comprimés latéralement, longs de 7 mm, blancs, légèrement recour-

bés vers l'androgynophore, l'intérieur à filaments soudés à la base, filiformes, longs de 5 mm, rouges ; operculum dressé, attaché à la moitié du tube floral, denté à la marge ; limen membraneux, entourant étroitement l'androgynophore sur son tiers inférieur ; androgynophore rouge, 2 fois aussi long que le tube floral ; étamines à filet rouge, anthères dorsifixes, rectangulaires, jaune vert ; ovaire à pubescence blanche, styles claviformes, rouge vif, à stigmates jaunâtres.

Fruit inconnu.

PARATYPE. — *Feuillet 4394*, Guyane Française, Station des Nouragues, Bassin de l'Arataye, 4°3'N, 52°42'W, 400 m, 28 août 1987 (CAY).

RÉPARTITION, ÉCOLOGIE ET BIOLOGIE. — *Passiflora aimae* est une liane forestière qui semble assez rare. Les deux spécimens cités sont les seuls connus aujourd'hui. Ils ont été récoltés à proximité de stations de recherche permanentes situées en forêt dense humide primaire où la végétation peut être suivie toute l'année. Les plantes poussent en lisière de forêt humide, dans un milieu ouvert en phase de régénération. Celle dont provient le spécimen-type fait partie d'une végétation basse de bord de piste ; d'après les observations faites par l'un de nous (H.A., avril 1997 et mars 1998), elle se développe dans des conditions défavorables, ou bien il s'agit d'une espèce à croissance assez lente. Elle a été observée en phase jeune seulement.

Toutes les fleurs observées ouvertes présentaient les mêmes signes de prédation par des fourmis. La base du tube était percée et les fourmis entraient et sortaient par ces ouvertures, probablement attirées par le nectar. Plusieurs fourmis étaient poudrées de pollen, et les anthères manquaient. En conséquence les étamines n'ont pu être étudiées que sur des boutons floraux. La fleur a une consistance charnue, au toucher un peu caoutchouteux, ce qui rappelle *P. amoena* Escobar, du sous-genre *Astrophea* (DC.) Masters.

AFFINITÉS. — *Passiflora aimae* appartient au sous-genre *Passiflora* (lectotype : *P. incarnata* L.). Il a des affinités avec plusieurs espèces des forêts de basse altitude du bassin Amazonien et d'Amérique Centrale (*P. araujoi* Sacco, *P. involucrata* (Mast.) Gentry, *P. coccinea* Aubl., *P. quadrifaria* Vanderplank, *P. quadriglandulosa* Rodschied, *P. speciosa* Gardner, *P. tholozanii* Sacco) et avec deux autres espèces des Andes Boliviennes (*P. buchtienii* Killip et *P. callimorpha* Harms). *Passiflora aimae* peut être aisément distingué de toutes ces espèces par ses feuilles crénelées et non dentées ou serrulées. Il est différent des deux espèces boliviennes et de *P. involucrata* (Mast.) Gentry par ses bractées non laciniées, et de *P. coccinea* par ses bractées beaucoup plus petites qui ne se chevauchent pas et ne masquent pas le tube floral.

ÉTYMOLOGIE. — L'épithète «*aimae*» honore Aimée GOVINDOORAZOO, mère du premier auteur, qui par sa patience et ses soins permanents continue à mener à bien sa collection de *Passiflora* à la Martinique. Il lui fait part de toute sa reconnaissance et gratitude d'existence.

Remerciements

Nous remercions vivement le Pr. Yves MONNIER, directeur du Jardin Botanique Exotique à Menton pour ses encouragements et Serge MARREL pour l'excellente illustration.

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Manuscrit reçu le 16 juillet 1998 ;
version révisée acceptée le 4 septembre 1998.

Preliminary revision of the genus *Sopubia* (Scrophulariaceae) in Madagascar

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KEY WORDS
Sopubia,
Scrophulariaceae,
Madagascar.

ABSTRACT
The Malagasy taxa of the genus *Sopubia* Buch.-Ham. ex D. Don are revised, including a discussion of the type species, *S. trifida*, a variety of which inhabits Madagascar. Two new species are described, *S. lemuriana* and *S. gracilis*, and one new synonym is mentioned. A key to the species is provided, along with descriptions, illustrations, and data on their distribution.

MOTS CLÉS
Sopubia,
Scrophulariaceae,
Madagascar.

RÉSUMÉ
Les espèces malgaches du genre *Sopubia* Buch.-Ham. ex D. Don sont revisées, avec une discussion du type du genre, *S. trifida*, dont une variété se trouve à Madagascar. Deux espèces sont décrites comme nouvelles, *S. lemuriana* et *S. gracilis*, et un synonyme nouveau est mentionné. Une clé des espèces ainsi que des descriptions, des illustrations et des données sur leur répartition sont présentées.

INTRODUCTION

The genus *Sopubia* Buch.-Ham. ex D. Don comprises about 25 to 30 species, most of them in the Old World tropics. The genus is based on a somewhat problematic type species, *S. trifida* Buch.-Ham. from Nepal, first described in 1825. The concept of the genus rests on the structure of the androecium consisting of four stamina, each with two different thecae, one normal-sized and fertile, the other sterile and reduced in size.

BENTHAM (1846) already puts the genus into the tribe Gerardieae, in which it is still placed today. However, because of the unequal thecae, he distinguishes within the tribe a group of several genera (besides *Sopubia Graderia*, *Harveya*, *Aulaya*, which was later merged with *Harveya*, and *Centranthera*) as "Sopubieae" and opposes them to the "Gerardieae verae". Neither VON WETTSTEIN (1891) in his treatment of the Scrophulariaceae in ENGLER & PRANTL's "Natürliche Pflanzenfamilien" nor later authors subscribe to this formal distinction as a subtribe. Nevertheless, the morphology of the antherae is still the taxonomic criterion on the basis of which *Sopubia* is singled out in most taxonomic keys.

The species of *Sopubia* known today are subshrubs or herbs with subrotate corollae and elegant, linear to lanceolate, simple or dissected leaves. They live as hemiparasites in the dry or moist grasslands at higher altitudes or in or near swampy areas including disturbed or cultivated ground such as rice paddies in the lowlands.

BENTHAM (1846) was the last (and, apart from George DON 1838, the only) author to revise the genus worldwide. He lists six species, among them *S. trifida* var. *madagascariensis* as the only species then known from Madagascar. Subsequently, BAKER (1882 and 1886) described two new species, one of which (*S. stricta* Baker) now turns out to be *Micrargeria filiformis* (Schum. & Thonn.) Hutch. & Dalziel. BONATI (1927) still lists the three species in his catalogue of Scrophulariaceae collected in Madagascar for the Muséum d'Histoire Naturelle at Paris. However, his description of *S. stricta* relates to a plant with a more zygomorphic flower and therefore already seems to indicare its true identity as *Micrargeria*.

Since BONATI's catalogue no further study on *Sopubia* in Madagascar has been published. When reviewing herbarium specimens for the treatment of the genus within the "Flore de Madagascar et des Comores" we realized that some of the specimens could not be placed in either one of the three (rsp. two) known species. On the other hand, these specimens did not seem to relate to the African specimens of *Sopubia* seen earlier for a planned worldwide revision of the genus. This study consequently identifies two new species of *Sopubia* from Madagascar and investigates the taxonomic relations between the Malagasy species and species of *Sopubia* from neighbouring floral regions.

MATERIAL AND METHODS

This study is based on the investigation of dried specimens mainly from the Paris herbarium (P). In addition, the following herbaria were consulted (abbreviations according to HOLMGREN et al. 1990): BONN, BR, FR, K, M. Material collected by E. FISCHER during a field trip to Madagascar in 1993 and fixed in Ethanol was also studied. All quoted specimens have been seen unless indicated otherwise.

GENERAL CONSIDERATIONS

We set out from BENTHAM's description of *S. trifida* var. *madagascariensis* which is the only description of this species from Madagascar available today. According to BENTHAM, *S. trifida* var. *madagascariensis* is a perennial (as HAMILTON describes the type from Nepal) herb, branched, with simple or rarely trifid leaves and purple flowers. While his description is so general that it matches most of the material seen, it does not fit in particular a number of specimen with white flowers. We noted furthermore that, while there is little variation in leaf characters and flower morphology, the size and number of flowers, the length of their pedicels and the general habit of the plants vary considerably.

HANSEN (1975) describes the type specimen of *S. trifida* in his revision of East African *Sopubia*,

as a slender herb with two or three stems extending from the thickened lower part of the stem. From this he concludes that the plants are likely to be perennials. Based on this character he distinguishes the type and other Asian material from the—annual and yellow-flowered—*S. eminii* Engl. According to HANSEN, all African material named *S. trifida* falls under *S. eminii*, making *S. trifida* a purely Asian species. MIELCAREK (1996) subsequently treated *S. eminii* as a subspecies of *S. parviflora* Engl. We have little doubt that these two taxa are at least very closely related.

BENTHAM, and earlier George DON (1838), describe a second possible colour for the flowers of *S. trifida*, yellow with a purple centre, based on collections by EDGEWORTH and ROYLE (not yet seen by us). BONATI (1927) still mentions both colours, but most modern Asian Florae describe *S. trifida* solely as a yellow-flowered branched annual herb (for example YAMAZAKI 1985, 1990). BENTHAM already suspected a confusion of two species, *S. trifida* sensu HAMILTON and the yellow-flowered species, for which a new name will most probably be required. The Malagasy specimen of *S. trifida* match BENTHAM's description of the variety *madagascariensis* well, whereas *Sopubia* of the yellow type (much branched and with an annual appearance) seem to be missing. *Sopubia trifida* var. *madagascariensis* Benth. is therefore retained as the appropriate name.

BAKER (1882, 1886) described two new species of *Sopubia* from Madagascar, based on acquisitions by R. BARON. The first, *S. stricta* Baker, the type of which (*Baron 2709*) is represented by a duplicate sheet in P, along with other specimens of *S. stricta* from Madagascar, proved to be identical with *Micrargeria filiformis* (Schum. & Thonn.) Hutch. & Dalziel. The name " stricta " would have been illegitimate anyway, since George DON already used the same to describe a collection by WALLICH from Burma, which differs in some characters from BAKER's description.

Sopubia triphylla Baker as the second of BAKER's new species has simple, unbranched stems, upright, simple, and comparatively short leaves in whorls of three, and flowers in the same disposition. Neither BARON nor BAKER specifies the colour of the flowers. Neither do they mention the plant's life cycle (annual vs. perennial). However, the name is valid and the description fits a number of Malagasy perennial, pale purple-flowered specimens well.

Among the remaining material, two groups could be identified whose set of characters do not match either the description of *S. trifida* or that of *S. triphylla*. One group has white flowers in a lax inflorescence, few mostly trifid leaves with large internodes, distinctively reflexed bracts, and an annual root system. The second group consists of smaller plants with small pale purple flowers, much branched stems, and simple leaves. Both groups are in the following described as new species.

Some two dozen specimens, mostly older or without the decisive parts for a proper determination, could not be assigned to one of those four species. It cannot be excluded, in the light of the material seen so far, that more than four species exist on Madagascar. Further studies might therefore produce one or two additional new descriptions.

IMPORTANT GENERIC CHARACTERS

We find that, in accordance with previous authors, the genus *Sopubia* is well defined by its anther morphology. The existence of one reduced, sterile theca and the shape, size, and the long-haired margins of the stomium of the fertile theca seem to be very constant throughout the genus. All four anthers are coherent at anthesis. The androecium of *S. gracilis* (Fig. 1) is given as an example. We did not notice any remarkable variations between the African, and Malagasy material and Asian material of *S. trifida* seen. Where the anther structure differs from this pattern, as in *S. delphinifolia* G. Don (treated as synonymous with *S. fastigiata* Bonati by YAMAZAKI 1985, 1990), further studies might lead to the conclusion that this species should not be included in the genus.

Another typical character seems to be the pattern of pilose and glabrous longitudinal rows along the stems and branches. A part of the stem of *S. trifida* (Fig. 2) is given as an example. At

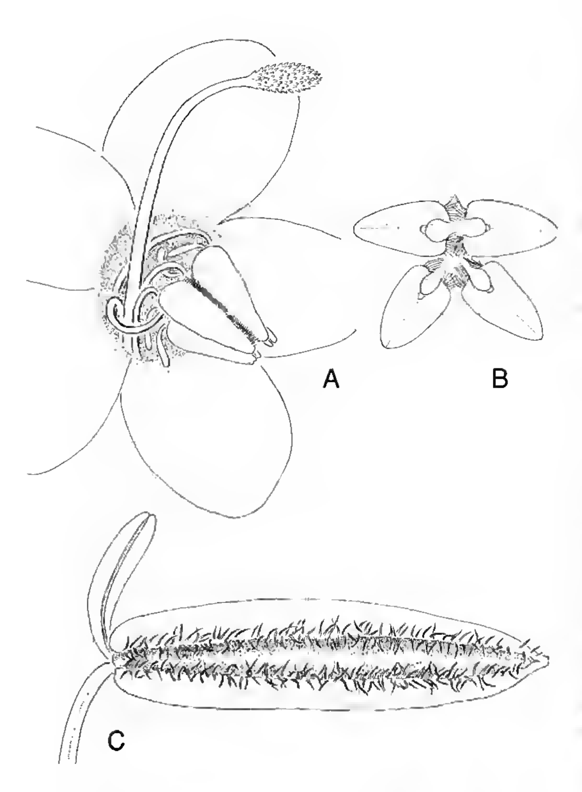


Fig. 1.—**A**, arrangement of stamens in ***Sopubia***; **B**, frontal view; **C**, stamen, showing hairy margin of the stomium. All from *S. gracilis*, *Keraudren 165*).

the nodes, pilose rows split in the middle, each half branching off to, and continuing on the margin of the neighbouring cauline leaf. Glabrous strips end immediately below the insertion point of the leaves at the stem. Above the leaves, new pilose strips continue along the stem. If a leaf axil carries a branch or pedicel, the ad- and the abaxial sides of the branch or pedicel are pilose, too. This pubescence can be rather dense to sparse. In drying, the rows of hairs tend to thin out, sometimes giving the plant a wholly glabrous appearance.

Lastly, the hair pattern of the calyx is distinctive. As in cauline leaves and bracts, the outside margins of the calyx lobes and, to a lesser extent, the midrib are pilose with short, recurved hairs on whitish-hyaline cushions (in all four species these cushions merge into a whitish crust when drying). The inner tips and margins of the calyx lobes are covered with long woolly-tomentose hairs. The inside of the calyx tube is glabrous.

Some of these characters have been mentioned for one species or another. They have not, however, been recognized as distinguishing characters for the genus (with the exception of the anthers consisting of one fertile and one sterile theca). We feel that a revised concept of the genus should put some emphasis on these characters as well.

PHYTOGEOGRAPHY

The four Malagasy species do not match any of the African species seen by us so far. The Malagasy *S. triphylla* bears some resemblance in its general habit to the pan-African *S. mannii* Skan var. *tenuifolia* (Engl. & Gilg) Hepper, but differs in some leaf and flower characters. A closer study of the Asian material still pending, the Malagasy *S. trifida* as a purple-flowered perennial seems to be very similar to some specimens labeled as *S. trifida* seen from Sri Lanka and India itself. *Sopubia triphylla*, *S. lemuriana*, and *S. gracilis* are most probably Malagasy endemics.

Sopubia is well represented in tropical Africa with approximately 15 to 20 species, and probably has its centre of diversity in the highlands to the East of the continent. The species reported from the Southwest, in particular from Angola and Namibia, seem to deserve a closer look; see for example CUCCUINI (1991). In the North, *Sopubia* reaches up to the borders of the Saharo-Sindic region (Tchad, Sudan, Ethiopia), without extending into it. It seems to be missing from the mountains of Yemen and Oman, as well as from the archipelagos of the Indian Ocean. Several species are reported from the Indian subcontinent, as well as from Burma, Thailand, Laos, Cambodia, Vietnam and China. To the south, the annual yellow-flowered species figures as *S. trifida* in BACKER & BAKHUIZEN's Flora of Java (1965). Going on the Pacific Rim, we have seen specimens of *Sopubia* from the Phillipines under the name of *S. trifida* which do not match either HAMILTON's or YAMAZAKI's description, as well as LEICHHARDT's collection from Queensland quoted in BENTHAM's Flora Australiensis (1869),

definitely a *Sopubia* but probably also not belonging to *S. trifida* Buch.-Ham. There are no reports of *Sopubia* from the New World.

Apparently, *Sopubia* occurs in two distinct areas, the first comprising all of tropical Africa (incl. South Africa), the second stretching from India to South East Asia and south to Australia, with the Sahara-Sindic desert belt separating the two ranges.

On Madagascar, *Sopubia trifida* is the most widespread species, inhabiting most of the central highland between Ambatondrazaka and Ihosy. *Sopubia triphylla* has so far been collected mainly from the Ankaratra mountains between Antananarivo and Antsirabe, with one certain find from the Itremo area. *Sopubia gracilis* seems to be confined to the Itremo mountains. *Sopubia lemuriana* covers a wider range with finds stretching from the Antananarivo area to the Itremo region.

Key to the species of *Sopubia* in Madagascar

1. Flowers white, corolla 12 to 15 mm in diameter. Plant up to 60 cm high. Cauline leaves few .... **S. lemuriana**
1'. Flowers dark or pale purple 2
2. Flowers large, corolla 15 to 18 mm in diameter, calyx up to 6 mm long. Stems simple or only lightly branched 3
2'. Flowers smaller, corolla 8 to 10 mm in diameter, calyx 3-4 mm long, stems normally much-branched .... **S. gracilis**
3. Cauline leaves mostly in whorls of three, simple, 20 to 25 mm long, 1.5 to 3 mm wide, upright. Flowers pale purple, mostly in whorls of three .... **S. triphylla**
3'. Cauline leaves alternate, opposite (decussate) or in whorls of three or four, lower ones (rarely some bracts as well) dissected, with three (sometimes two) linear segments, or simple, 25 to 40 mm long, 1.5 to 1.8 mm wide, spreading. Flowers more or less darkpurple, alternate, opposite or in whorls of three or four .... **S. trifida**

Sopubia trifida Buch.-Ham.
var. **madagascariensis** Benth.

In DC., Prodr. 10: 522 (1846).

TYPE.—*Lyall 231*, Madagascar (holo-, K).

Perennial, 45 to 60 cm high. Stems ascending to erect, one or more from the same root stock. The axils of the cauline leaves carry shoots that normally stay short. Only if the main axis is disturbed do the shoots immediately below the point of disturbance grow to normal-sized branches and form inflorescences. If the main axis remains undisturbed and able to terminate its growth with an inflorescence, it stays without branches or develops only a few (two to three) branches immediately below the inflorescence.

Stem 2.5 to 3 mm in diameter, woody at the base, the lower part cylindical, angular above, with the characteristic pattern of longitudinal rows of hairs alternating with glabrous strips. Leaves few to many, alternate, opposite (decussate) or in whorls of three or four, on branches mostly opposite, fewer than on the main axis. Internodes 10-15 mm long (sometimes longer int the upper part of the stem).

Cauline leaves below mostly three-fid (sometimes only two segments) or simple, above and in the inflorescence mostly simple (although two-fid or even three-fid bracts occur), linear or with linear segments, 25 to 40 mm long, 1.5 to 1.8 mm wide, margins slightly revolute, midrib and margins pilose.

Inflorescence a lax raceme, internodes mostly longer than the flowers on their pedicels. Bracts resemble smaller cauline leaves, spreading to reflexed. Pedicels 12 to 14 mm long, shorter than the bracts (in drying, bracts and cauline leaves become rather brittle and tend to break off easily). Flowers alternate, opposite (decussate) or in whorls of three or four.

Flowers more or less dark purple. Bracteoles linear to narrowly lanceolate, 2 to 3 mm long,

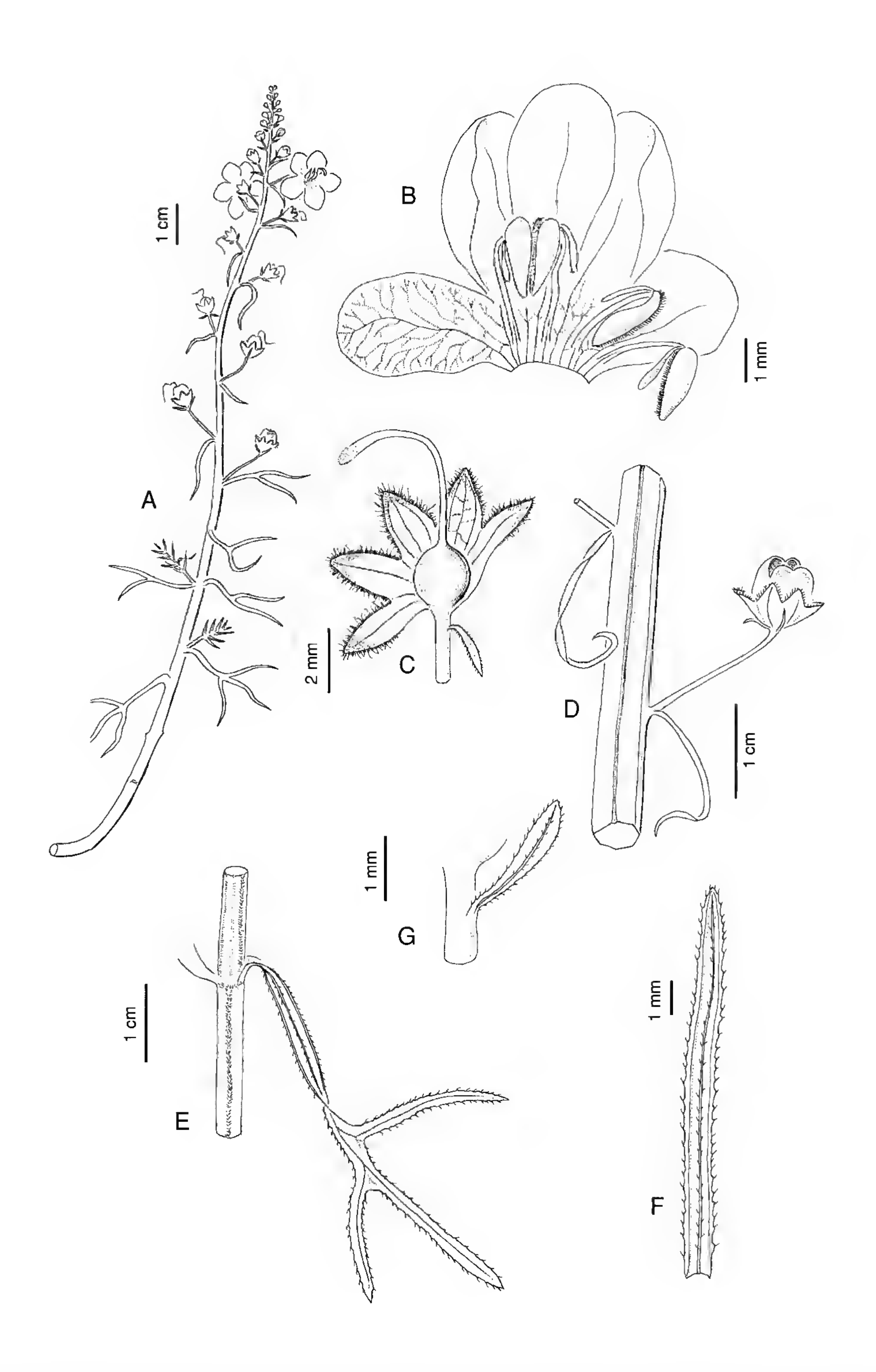


Fig. 2.—***Sopubia trifida***: **A**, habit; **B**, dissected corolla; **C**, dissected calyx showing ovary and style; **D**, part of stem with fruit; **E**, stem leaf; **F**, bract; **G**, bracteole. A, D from *Viguier & Humbert 1213*; B-C from *Waterlot 716*; E-G from *Lowry 4515*.

margins and midrib densely pilose, not protruding over the calyx tube. Calyx up to 6 mm long, its teeth obtuse, their length equalling the tube. Inner tips and margins of the teeth densely woolly, midrib and outer margins of the teeth sparsely pilose. Corolla 15 to 16 mm in diameter, its segments subequal.

Capsule 6 to 7 mm long, glabrous. Seeds truncate, their surface reticulate.

Wet and dry grasslands up to 2300 m, borders of swamps, rice paddies, and other moist places.—Figs. 2, 6.

MATERIAL STUDIED.—*Académie Malgache s.n.*, Ambatondrazaka, Mar. 1905 (P); *Académie Malgache s.n.*, Imerina, Dec. 1908 (P); *Baron 142*, Madagascar (P); *Benoist s.n.*, Tananarive, Antsirabe, Apr. 1951 (P); *Benoist 646*, Antsirabe, 22 Dec. 1950 (P); *Boissieu s.n.*, s.loc., s.d. (P); *Bosser 18856*, Ankaratra, Rte. d'Ambatolampy à Fatatsiko, 2200-2300 m, Feb. 1964 (P); *Bosser 19419*, Andringitra, Apr. 1964 (P); *Campenon s.n.*, Imerina, 1887 (P); *Cours 130*, Ankaroka (Ambatondrazaka), 30 Jan. 1938 (P); *d'Alleizette 70*, Ivohibe, Nov. 1924 (P); *d'Alleizette 832M*, Tananarive, lieux humides, Oct.1906 (P); *Deans Cowan s.n.*, Ankafana, 1880 (P); *Decary s.n.*, Ambatolaona, Mar. 1919 (P); *Decary 643*, Ambohimanga, 27 Mar. 1921 (P); *Decary 13411*, Tsiafajarona, Sep. 1938 (P); *Decary 17208*, Manankazo, Lampokotsa d'Ankazobe, 3 Jan. 1942 (P); *Geneaud 8*, environs de Tananarive, Apr. 1892 (P); *Guillaumet 2021*, Anjozorobe, 28 Mar. 1968 (P); *Hildebrandt 3713*, Andrangoloaka (Ost-Imerina), Nov. 1880 (K, M); *Homolle 1200*, Mt. Boby, 1946 (P); *Humbert 1324*, Tananarive, Ambrahi, Nov. 1935 (P); *Humbert 28218*, montagnes à l'Ouest d'Itremo (West Betsileo), 1500-1700 m, Jan. to Apr. 1955 (P); *Humbert 29985*, montagnes à l'Ouest d'Itremo (West-Betsileo), 1500-1700 m, Jan. to Apr. 1955 (P); *Humbert 30016*, montagnes à l'Ouest d'Itremo (West-Betsileo), 1500-1700 m, Jan. to Apr. 1955 (P); *Humblot 623*, Madagascar, s.d. (P, K); *Jard. Bot. Tananarive 3190*, s.loc., Jan. 1938; *Jard. Bot. Tananarive 4749*, Mt. Tsitondroina, 15 Apr. 1941 (P); *Keraudren 40*, Angavokely (Tananarive), Feb. 1960 (P); *Keraudren 260*, Ambatofiterahana, entre Ambositra et Fianarantsoa, 1500 m, Mar. 1960 (P); *Lowry 4515*, Andringitra Res., Antanifotsy (Ambalavao), 1400 m, 5 Mar. 1989 (P); *Morat 1289*, Andringitra, June 1965 (K, P); *Réserves Naturelles 3038-RN*, *Radafindrakolo*, Sendrisoa (Fianarantsoa), 6 May 1951 (P); *Réserves Naturelles 3990-RN*, *Radafindrakolo*, Vohitsaoka (Ambalavao), 30 Mar. 1934 (P); *Réserves Naturelles 5587-RN*, *Randriamiera*, Sendrisoa (Ambalavao), 15 June 1953 (P); *Réserves Naturelles 9627-RN*, *Rakotovao*, Ambatosoratra (Ambatondrazaka), 16 Dec. 1958 (P); *Réserves Naturelles 11298-RN*, *Rakotovao*, Momaka (Ambatondrazaka), 19 Nov. 1960 (P); *Peltier 1060*, Tananarive, July 1959 (P); *Peltier 1182*, Amboasary (Ambatolampy), 22 Oct. 1959 (P); *Peltier 1558*, Sabotsy, Massif de l'Antongona, 4 Dec. 1959 (P); *Peltier 1612*, Ambatofotsy (Tananarive), 18 Dec. 1959 (P); *Peltier 3444*, s.loc., s.d. (P); *Perrier de la Bâthie 11405*, Ambositra, prairies, Sep. 1911 (P); *Perrier de la Bâthie 14995*, Andilamena, marais, Nov. 1922 (P); *Viguier & Humbert 1213*, Ambatolaona (Manjakandriana), 1400 m, 11 Nov. 1912 (P); *Viguier & Humbert 1490*, Ambohiponana (Antsirabe), 1400 m, 20 Nov. 1912 (P); *Viguier & Humbert 1641*, Itasy, Massif d'Ankaratra, 2600 m, 27 Nov. 1912 (P); *Waterlot s.n.*, Tananarive, Dec. 1917 (P); *Waterlot 716*, Angavo (Manjakandriana), Mar. 1923 (P).

Sopubia triphylla Baker

J. Bot. 20: 220 (1882).

TYPE.—*Baron 141*, Central Madagascar (holo-, K; iso-, P)

Perennial, but somewhat delicate, stems erect, 35 to 40 cm high, one or more from the same root stock. The axils of the cauline leaves carry shoots that normally stay short. Only if the main axis is disturbed do the shoots immediately below the point of disturbance grow to normal-sized branches and form inflorescences. If the main axis remains undisturbed and able to terminate its growth with an inflorescence, it normally stays without branches.

Stem 2 to 2.5 mm in diameter, slightly woody at the base, the lower part cylindical, angular above, more densely leafed than the preceding species. Leaves mostly in whorls of three, at times alternate.

Cauline leaves rather erect, simple, narrowly triangular to linear, 20 to 25 mm long, 1.5 to 3 mm wide, margins slightly revolute, midrib and margins pilose.

Inflorescence a lax to dense raceme, internodes mostly shorter than the flowers on their pedicels. Bracts resemble smaller cauline leaves, uptight. Pedicels 12 to 18 mm long, mostly longer than the bracts. Flowers in whorls of three, rarely alternate.

Flowers pale purple. Bracteoles linear to narrowly lanceolate, 2 to 3 mm long, margins and midrib densely pilose, not protruding over the calyx. Calyx up to 6 mm long, its teeth triangular, more acute than in the preceeding species, their length equalling the tube. Inner tips and margins of the teeth densely woolly, midrib and outer margins of the teeth sparsely pilose. Corolla 15 to 18 mm in diameter, its segments subequal.

Capsule 6 to 7 mm long, glabrous. Seeds truncate, their surface reticulate.

Mountainous regions up to 2200 m.—Figs. 3, 6.

MATERIAL STUDIED.—*Baron 141*, Central Madagascar, 1889, type (K, P); *Baron 242*, Madagascar, s.d. (P); *Baron 5242*, NW Madagascar, 1887 (K); *Bosser 18349*, Tananarive, Iarinandriana (P); *Catat 287*, Ankaratra, 2200 m, 2 May 1889 (P); *Catat 299*, Ankaratra, 2 May 1889 (P); *Catat 300*, Ankaratra, 2000 m, 2 May 1889 (P); *Catat 349*, Ankaratra (versant Est), 1889 (P); *Catat 1264*, Miantsoarivo, 13 May 1889 (P); *Decary 17433*, Valozoro, Ambohimahasoa, 6 Feb. 1942 (P); *Decary 17655*, Antsampandrano (Ankaratra), 1700 m, 10 Feb. 1942 (P); *Jard. Bot. Tananarive 2362*, Votovorona (Antsirabe), 4 July 1935 (P); *Jard. Bot. Tananarive 3173*, Behenjy, 12 Feb. 1938 (P); *Le Myre de Viliers s.n.*, s.loc. (P); *Perrier de la Bâthie 11496*, Mt. Ambona jusqu'à 2200 m (Antsirabe), May 1912 (P).

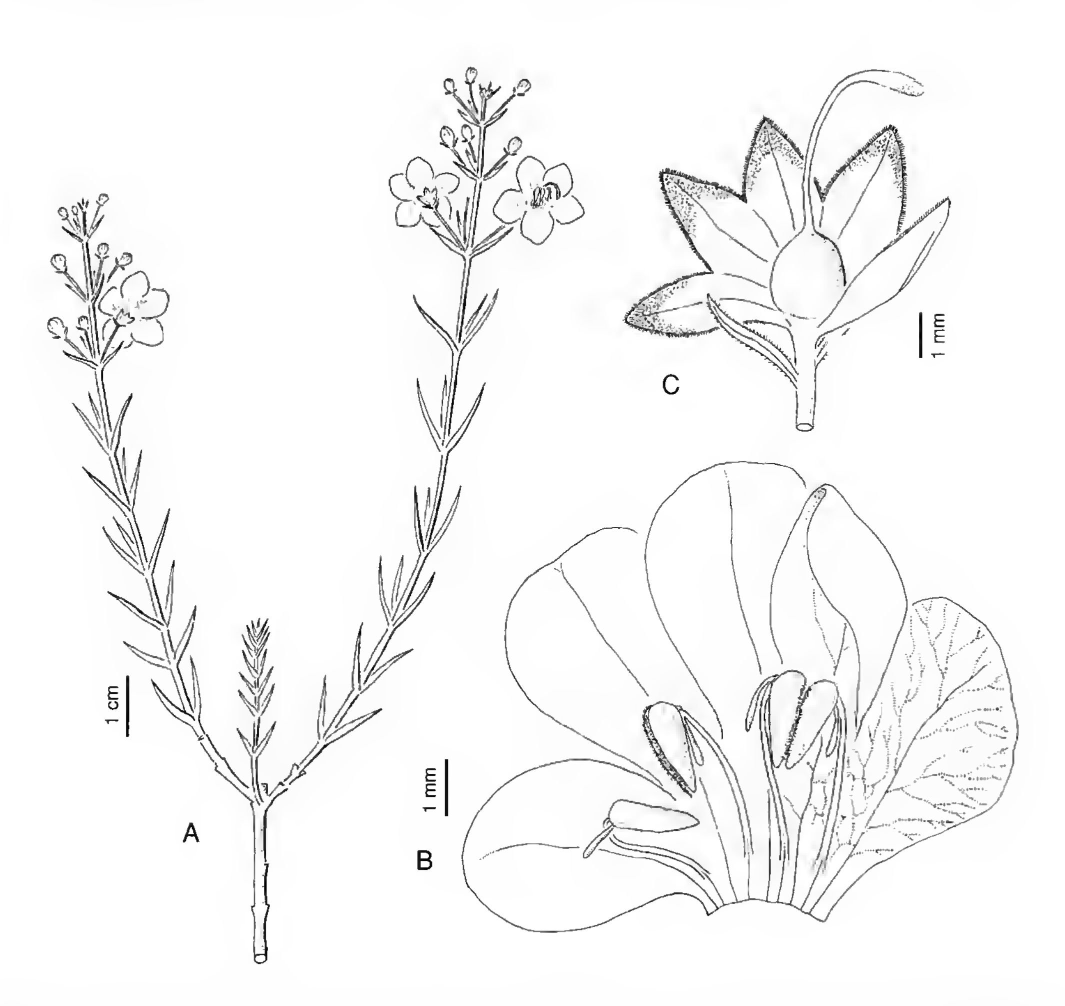


Fig. 3.—***Sopubia triphylla***: **A**, habit; **B**, dissected corolla; **C**, dissected calyx showing ovary and style. All from *Perrier de la Bâthie 11496*.

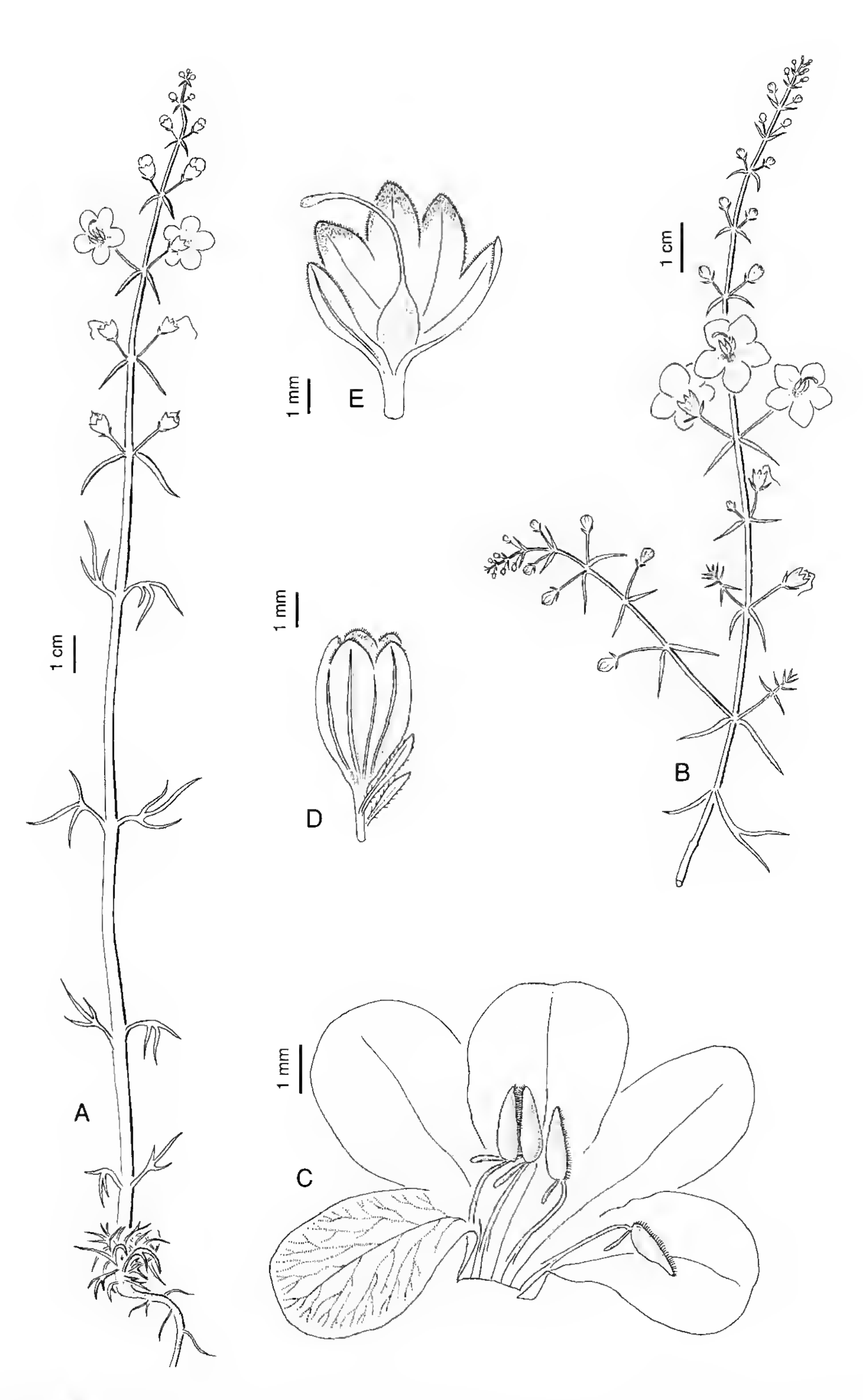


Fig. 4.—***Sopubia lemuriana***: **A**, habit; **B**, inflorescence; **C**, dissected corolla; **D**, calyx; **E**, calyx dissected. A from *Schlieben 8192*; B-E from *Fischer 197*.

Sopubia lemuriana H.-P. Hofmann & Eb. Fisch., **sp. nov.**

Herba annua, caulis erectus. Folia pauca, inferiores trifida laciniis linearibus, superiores integra, lineari-angustissima. Inflorescentia racemosa, laxa. Bracteae distincte reflectae. Flores albi. Corollae 12 usque ad 15 mm diametro. Ab S. trifida *differt floribus albis internodiisque distincte longioribus.*

TYPE.—*Schlieben 8192*, Madagascar, Ambalamanaka, 18 Dec. 1959 (holo-, M; iso-, BR, K).

Annual plant, 50 to 60 cm high. Stems erect, simple to strongly branched. Stem 2.5 to 3 mm in diameter, slighty woody at the base, the lower part cylindrical, angular above, with the characteristic pattern of longitudinal rows of hairs. Cauline leaves few, sometimes crowded at the base of the stem, widely spaced in the middle section of the stem with internodes approaching 30 mm, opposite (decussate) or alternate, sometimes in whorls of three or four.

Cauline leaves below mostly three-fid (sometimes with only two segments), delicate, segments linear, 25 to 35 mm long, 1.5 mm wide, above undivided and shorter. Margins slightly revolute, midrib and margins pilose.

Inflorescence a lax raceme, internodes more or less equalling the flowers on their pedicels. Bracts undivided, linear to narrowly triangular, distinctively reflexed. Pedicels up to 15 mm long, mostly longer than the bracts. Flowers decussate or rarely alternate.

Flowers white. Bracteoles linear to narrowly lanceolate, 2 to 3 mm long, margins and midrib densely pilose, rarely protruding over the calyx. Calyx 5 to 6 mm long, its teeth obtuse, shorter than the tube. Inner tips and margins of the teeth densly woolly, midrib and outer margins of the teeth sparsely pilose. Corolla 12 to 15 mm in diameter, its segments subequal.

Capsule 4 to 5 mm long, glabrous. Seeds truncate, their surface reticulate.

Mostly dry grasslands up to 1900 m, probably higher.—Fig. 4, 7.

PARATYPES.—MADAGASCAR: *Benoist 459*, Manjakatompo (Ankaratra), 19 Dec. 1950 (P); *Benoist 1643*, Manjakatompo (Ankaratra), 20 Dec. 1951 (P); *Bosser 7912*, Ambatomenaloha (Itremo), Sep. 1956 (P); *Catat 1117*, Managary, 9 June 1889 (P); *Croat 29776*, Fianarantsoa, Itremo, Jan. 1975 (P); *Decary 13105*, environs d'Ambatofinandrahana, 1600-1800 m, 20 Feb. 1938 (P); *Decary 17205*, Manankiazo, s.d. (P); *Decary 17610*, Antsampandrano (Ankaratra), 1900 m, 9 Feb. 1942 (P); *Fischer 197*, Ambalamanaka, secondary grassland in mountain forest, 29 Mar. 1993 (BONN); *Guillaumet 2042*, Andringitra, along RN 7, 8 Mar. 1968 (P); *Humbert & Capuron 28052*, Betsileo, Ambatofinandrahana, bois des pentes occidentales sur gneiss, 16 Jan. 1955 (P); *Jacquemin 1303*, Tananarive, Mt. Iharanandriana, Mar. 1973 (P); *Leeuwenberg & Rafamantanantsoa 14435*, Fianarantsoa, Ambalamana, Feb. 1994 (K, P); *Phillipson et al. 3875a*, 50 km W of Ambatofinandrahana (Itremo), 1670 m, 13 Mar. 1992 (MO, not seen, P); *Schlieben 8192*, Ambalamanaka, 18 Dec. 1959, type (BR, K, M).

Sopubia gracilis H.-P. Hofmann & Eb. Fisch., **sp. nov.**

Suffrutex perennis, caules plures ex eadem radice, erecti, ramosi. Rami caulim principalum non superandi. Folia integra, lineari-angustissima. Inflorescentia racemosa, laxa usque ad densa. Ab aliis speciebus madagascariensibus generis Sopubia *flores minores, purpurei pallidi. Corollae 8 usque ad 10 mm diametro. Ab* S. triphylla *differt floribus minoribus, caule valde ramificato et foliis rare tri-verticillatis. Ab* S. trifida *differt foliis integris.*

TYPE.—*Keraudren 165*, Madagascar, Rte. d'Ambositra à Ambatofinandrahana, Feb. 1960 (holo-, P).

Perennial little subshrub, 35 to 45 cm high. Stems erect, one or more from the same root stock, much-branched in a pyramidal fashion, the branches not protruding over the (undisturbed) main axis.

Stems 2 to 2.5 mm in diameter, woody at the base, the lower part cylindical, angular above, with the characteristic pattern of longitudinal rows of hairs, more or less densely leafed. Leaves subopposite (decussate), sometimes in whorls of three or four, rarely alternate.

Leaves simple, linear, 15 to 20 mm long, 1 mm wide, margins slightly thickened or revolute (in drying, margins curl upwards, giving the leaves a grooved appearance), midrib and margins pilose.

Inflorescence a lax to dense raceme, internodes equalling the flowers on their pedicels. Bracts

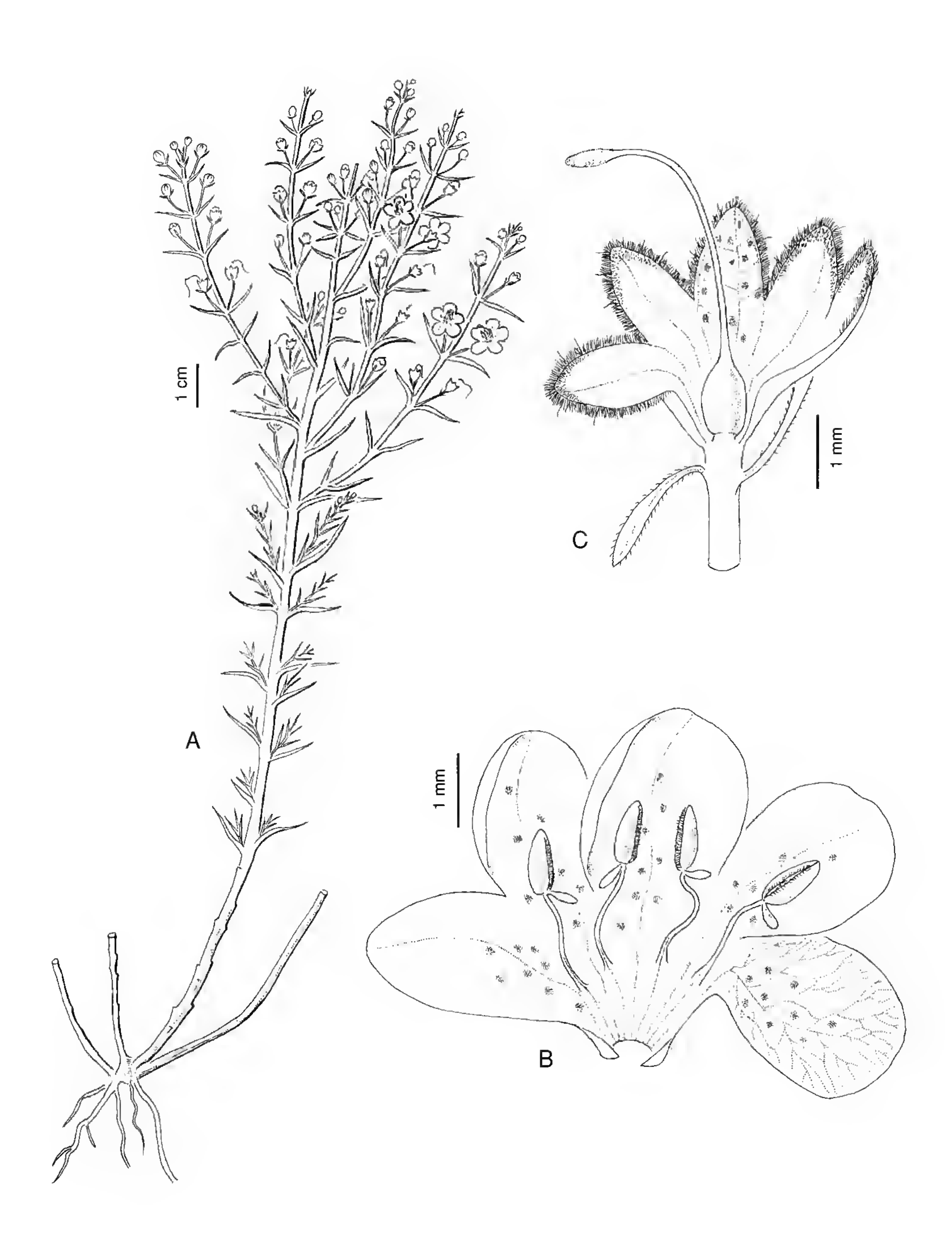


Fig. 5.—***Sopubia gracilis***: **A**, habit; **B**, dissected corolla; **C**, dissected calyx showing ovary and style. All from *Keraudren 165*.

resemble smaller cauline leaves, upright to spreading, appressed to the pedicels at least for 1 mm of their length. Pedicels up to 8 mm long, mostly longer than the bracts. Flowers opposite (decussate), in whorls of three, rarely alternate.

Flowers pale purple (probably sometimes even whitish). Bracteoles resembling small bracts, linear, 2 mm long, not protruding over the calyx tube. Calyx 3 to 4 mm long, its teeth obtuse to rounded, shorter than the tube. Inner tips and margins of the teeth densely woolly, midrib and outer margins of the teeth sparsely pilose. Corolla 8 to 10 mm in diameter, its segments subequal.

Capsule 3 to 4 mm long, glabrous, at maturity not protruding over the calyx. Seeds truncate, their surface reticulate.

Mostly dry places on open ground, up to 1800 m, probably higher.—Fig. 5, 7.

PARATYPES.—MADAGASCAR: *Catat 1150*, Ambohipronana, 20 May 1889 (P); *Decary 12918*, env. d'Ambatofinandrahana, 1600-1800 m, 15 Feb. 1938 (P); *Decary 12966*, env. d'Ambatofinandrahana,

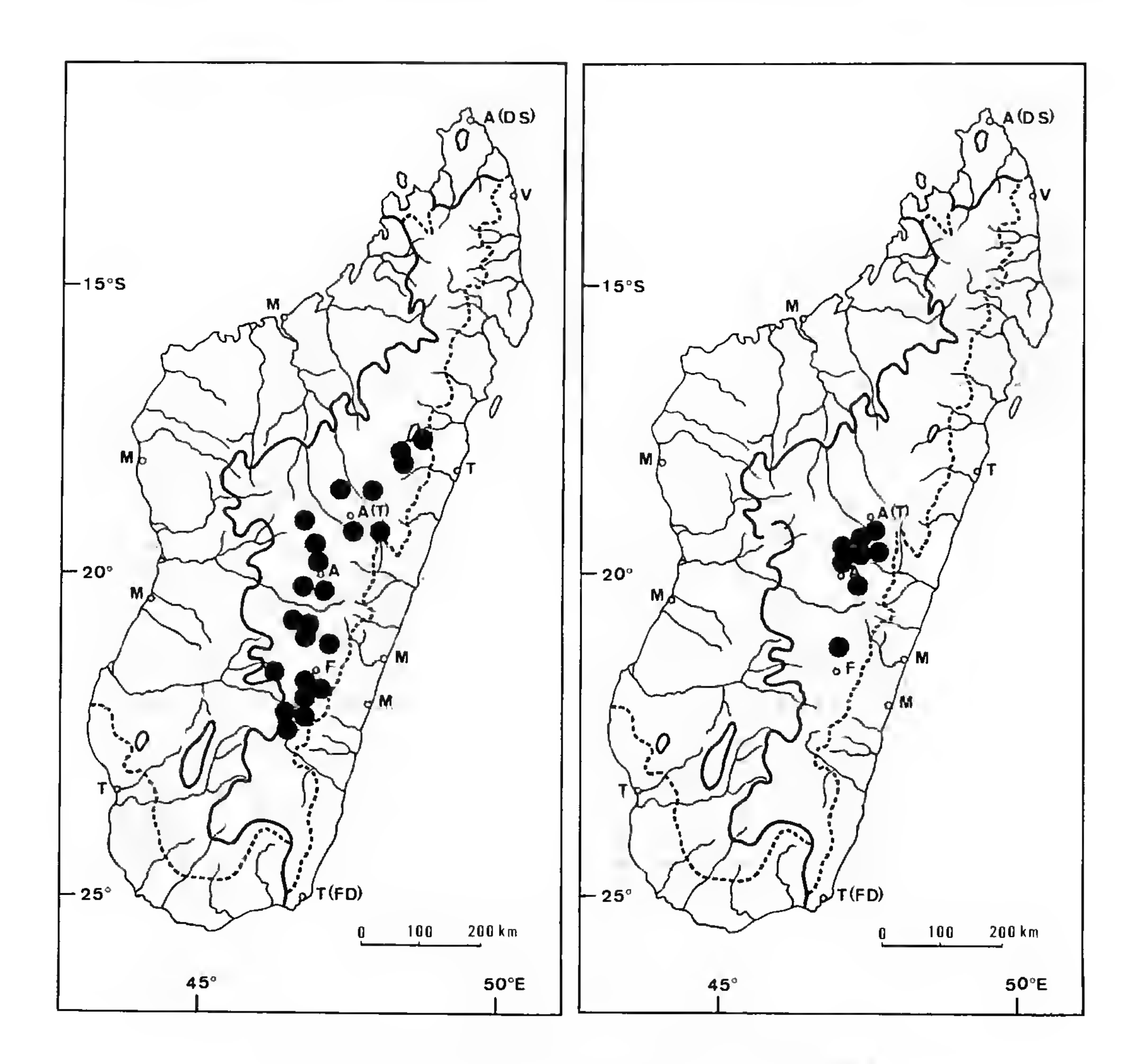


Fig. 6.—Geographic distribution of ***Sopubia***: left ***S. trifida***; right ***S. triphylla***.

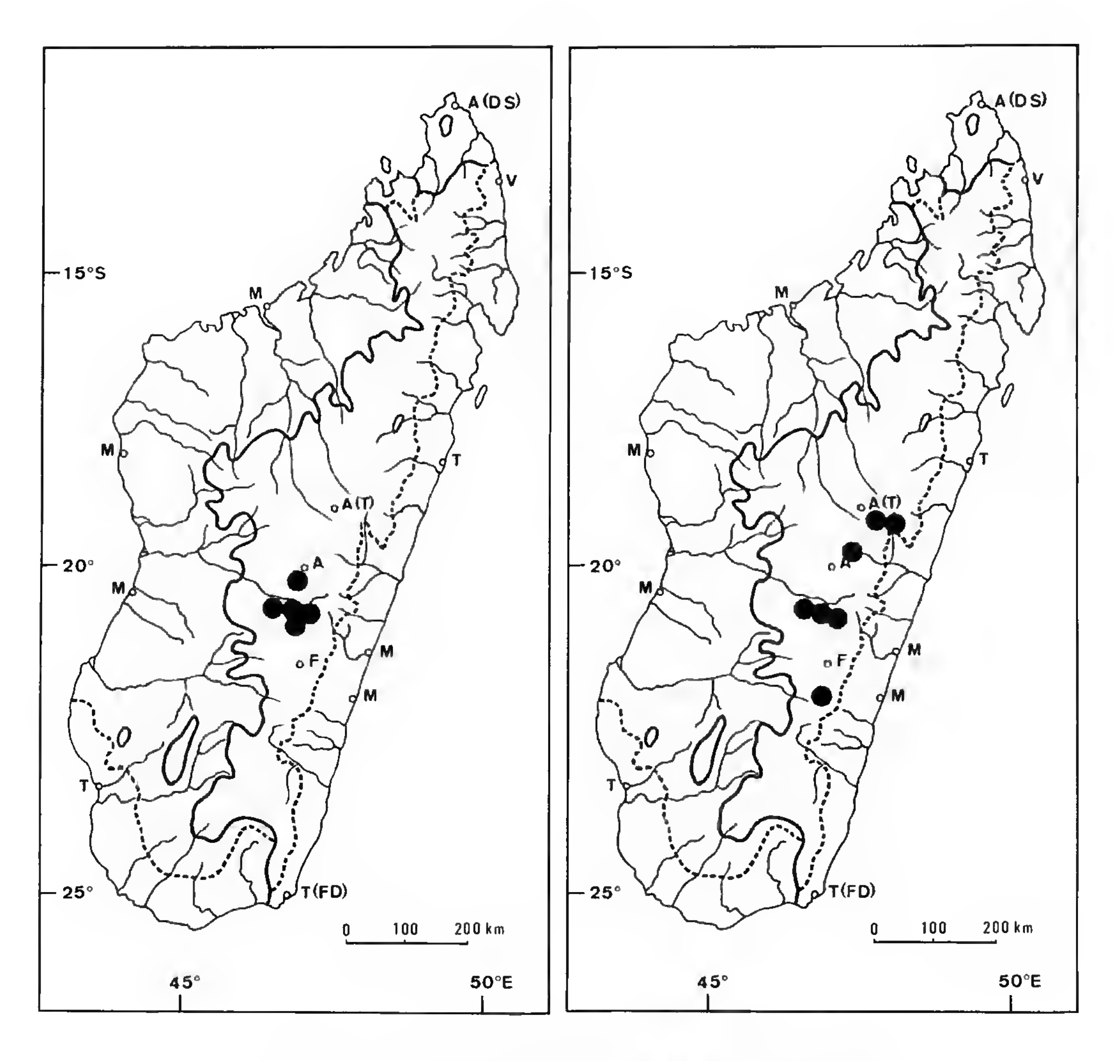


Fig. 7.—Geographic distribution of ***Sopubia***: left ***S. gracilis***; right ***S. lemuriana***.

1600-1800 m, 16 Feb. 1938 (P); *Decary 13075*, env. d'Ambatofinandrahana, 1600-1800 m, 19 Feb. 1938 (P); *Decary 13127*, env. d'Ambatofinandrahana, 1600-1800 m, 20 Feb. 1938 (P); *Dorr 3871*, Mt. Ibity (south), Fianarantsoa, 6 Feb. 1985 (MO, not seen, BR, K); *Keraudren 165*, Rte. d'Ambositra à Ambatofinandrahana, March 1960, type (P); *Perrier de la Bâthie 12366*, entre l'Ivato et la Mania (Itremo), 1500 m, Feb. 1919 (P).

Excluded species:

Sopubia stricta Baker = *Micrargeria filiformis* (Schum. & Thonn.) Hutch. & Dalziel.

Acknowledgements

We would like to thank the keepers of the following herbaria for the loan of specimens: BR, FR, K, M, P, and express our gratitude to Drs. P. BAMPS (BR) and F. BADRÉ (P) for additional information and practical advice.

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Manuscript received 26 February 1998;
revised version accepted 12 June 1998.

Biodiversité des Phanérogames parasites : leur place dans la classification systématique

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RÉSUMÉ

Les Phanérogames parasites représentent moins de 2% des Angiospermes ; leur organisation est caractérisée par des contacts de cellules à cellules, entre l'hôte et le parasite ; elles n'ont jamais de mycorhizes ; c'est une association de deux partenaires (« parasitisme direct »). Toutes les Phanérogames parasites (sauf *Cassytha*) sont placées dans les deux sous-classes supérieures de la classification des Dicotylédones de CRONQUIST. La plupart d'entre elles présentent des spécialisations parasitaires peu avancées : 64% des parasites sont épirhizes ; 88% sont hémiparasites ; 1% seulement sont endoparasites. Un autre type de parasitisme s'observe chez quelques Angiospermes sans chlorophylle mycotrophes ; c'est une association de trois partenaires : l'hôte, un champignon endotrophe et le parasite (« mycoparasitisme »). On ne connaît que peu d'exemples, parmi les Monocotylédones, les Dicotylédones et les Gymnospermes. Ces deux types de parasitisme se sont développés indépendamment. Le mycoparasitisme apparaît comme un phénomène ancien, issu des associations endomycorhiziales ancestrales. Le parasitisme direct apparaît au contraire comme un phénomène moderne, qui se développe dans des groupes taxonomiques récents ; il est probable que les espèces parasites deviendront plus nombreuses et plus spécialisées dans l'avenir.

MOTS CLÉS
plantes parasites,
plantes mycotrophes,
classification des Angiospermes,
origine du parasitisme.

ABSTRACT
The parasitic flowering plants represent less than 2% of the angiosperm species. Their organization is characterized by direct cellular contact between the host and the parasite; also, they never form mycorrhizae, and only two partners are associated ("direct parasitism"). All parasitic flowering plants (except *Cassytha)* belong to the two highest subclasses in CRONQUIST's classification of dicotyledons. Most exhibit relatively unspecialised parasitism; 64% are root parasites, 88% hemiparasites and only 1% endoparasites. Another type of parasitism occurs among mycotrophic achlorophyllous angiosperm; an association involving three partners: the host, an endotrophic fungus and the parasite ("mycoparasitism"), only a few examples of which are known among the monocotyledons, dicotyledons and gymnosperms. These two types of parasitism evolved independently; mycoparasitism appears to be an ancient phenomenon, derived from ancestral endomycorrhizal associations, whereas direct parasitism seems to be a younger phenomenon that evolved in recent taxonomic groups. In the future it is likely that parasitic angiosperm species will increase in number and specialisation.

KEY WORDS
parasitic plants,
mycotrophic plants,
Angiosperm classification,
origin of parasitism.

Les Phanérogames parasites sont suffisamment diversifiées quant à leur organisation, leur biologie et l'impact économique qu'elles peuvent avoir, pour avoir suscité d'importants travaux de recherche. En-deçà de cet intérêt scientifique, les plantes parasites ont marqué de longue date la pensée, les traditions et les mythes de l'homme qui a désigné ainsi toutes sortes de végétaux, lianes, épiphytes, simples mauvaises herbes des cultures ou vraies parasites. Mais la définition d'une « vraie » plante parasite n'est pas évidente.

Les Phanérogames parasites se nourrissent directement aux dépens d'autres Phanérogames vivantes, mais les auteurs (KUIJT 1969 ; VISSER 1981 ; WEBER 1993 ; SALLÉ et al. 1998) s'accordent sur le fait que cette relation trophique qui les unit à leur hôte ne suffit pas à les caractériser : elles sont définies à la fois par une organisation hautement adaptée à leur mode de nutrition et par le fonctionnement qui lui est corrélé.

Cependant certaines plantes, vivant aux dépens d'autres êtres vivants (essentiellement non-Phanérogames), pratiquent une nutrition de type parasitaire ; mais elles échappent à la définition classique en raison de la complexité et de la variabilité des relations hôte-parasite qu'elles entretiennent. Elles constituent un groupe taxonomiquement diversifié dont les espèces susceptibles d'exploiter d'autres Phanérogames ne sont pas bien recensées.

LE PARASITISME AU SENS STRICT : ASSOCIATION DE DEUX PARTENAIRES

Caractéristiques des parasites

Les plantes parasites sont munies d'un haustorium, « pont physiologique spécialisé et naturel, composé au moins en partie de tissus vivants, par lequel les nutriments et l'eau transitent d'un organisme à l'autre » (KUIJT 1969). Les cellules des deux partenaires s'y organisent les unes par rapport aux autres pour constituer une continuité anatomique et physiologique.

Le fonctionnement de la relation parasitaire résulte de multiples interactions entre les deux partenaires, qui se traduisent par exemple par la germination du parasite en réponse à un stimulus émis par l'hôte, par le développement chez l'hôte d'une structure hypervascularisée provoquée par

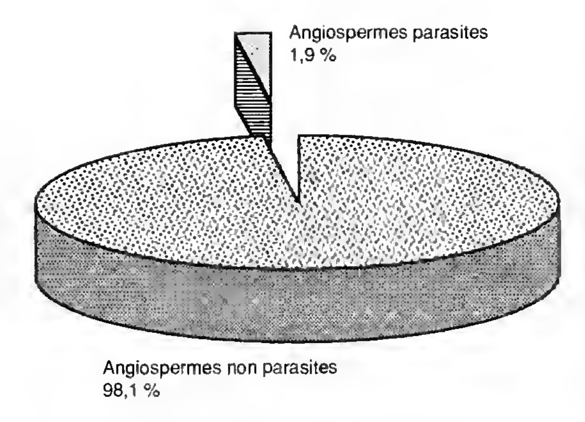


Fig. 1. — Évaluation numérique des espèces parasites.

le parasite, par la différenciation vasculaire orientée, chez chaque partenaire, en direction de l'autre pour aboutir à un contact direct.

On n'observe jamais d'associations mycorhiziennes chez les Phanérogames parasites ; les représentants des familles dans lesquelles se trouvent des parasites et des non-parasites sont tous démunis de mycorhizes. Par contre les hôtes parasités sont mycorhizés ou non, selon les cas.

Place des parasites dans la classification systématique

Les plantes parasites, malgré leur grande diversité, sont en nombre limité ; on en compte environ 4700 espèces, soit à peine 2% de l'ensemble des Phanérogames (Fig. 1) ; les évaluations numériques utilisées ici sont généralement basées sur MABBERLEY (1997). Comment se répartissent ces espèces dans la classification systématique ? Bien que formant un groupe hétérogène quant à leur biologie, leur organisation et leurs affinités systématiques, toutes les plantes parasites au sens strict sont des Dicotylédones, groupe dont elles représentent environ 2,5%. Aucune espèce de

Sous-classes: Magnoliidae, Hamamelidae, Caryophyllidae, Dilleniidae, Rosidae, Asteridae

Nombre d'espèces parasites: 0, 500, 1000, 1500, 2000, 2500

Laurales, Ranunculales, Hamamelidales, Urticales, Fagales, Polygonales, Malvales, Violales, Ericales, Primulales, Fabales, Myrtales, **Santalales**, **Rafflesiales**, **Polygalales**, Apiales, **Solanales**, **Lamiales**, **Scrophulariales**, Asterales

Ordres

Chaque graduation représente un ordre ; en gras, les ordres où se trouvent les parasites.

Fig. 2. — Répartition des Dicotylédones parasites dans la classification de CRONQUIST (1981). Les ordres sont énumérés dans la séquence de la classification.

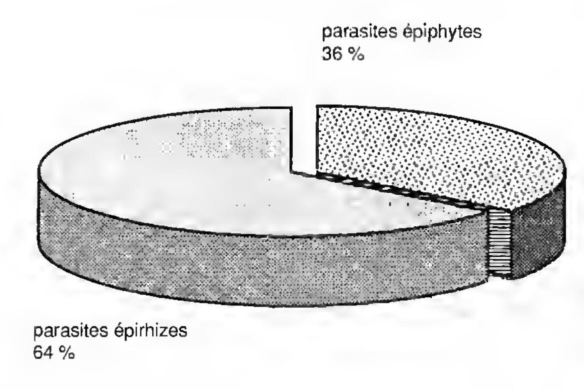


Fig. 3. — Comparaison numérique entre parasites épirhizes et épiphytes.

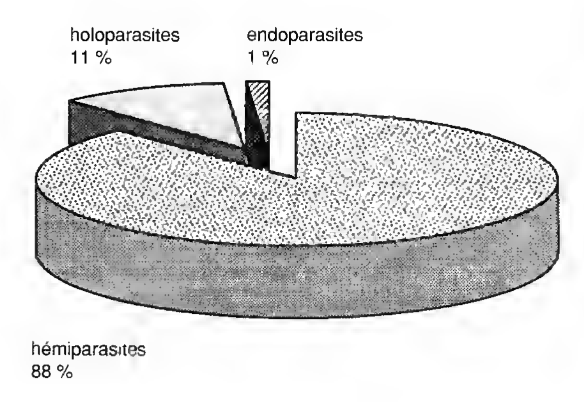


Fig. 4. — Comparaison numérique entre hémi-, holo-, et endoparasites.

Monocotylédones n'est parasite au sens de la définition ci-dessus (KUIJT 1969 ; VISSER 1981 ; WEBER 1993).

La classification de CRONQUIST (1981), dernier ouvrage en date proposant un tableau complet de l'ensemble des Angiospermes, est prise ici comme référence : les familles (groupées en ordres) sont classées en sous-classes ordonnées en une séquence à laquelle l'auteur reconnaît une signification évolutive ; les Dicotylédones comptent six sous-classes, numérotées de I. Magnoliidae à VI. Asteridae. Toutes les Phanérogames parasites se trouvent dans les deux dernières sous-classes (V. Rosidae et VI. Asteridae), les plus évoluées, à l'exception du genre *Cassytha* (Lauraceae, sous-classe I. Magnoliidae). — Fig. 2.

La diversité des Phanérogames parasites s'exprime selon deux critères. D'une part, on distingue les types de parasitismes : les hémiparasites, chlorophylliens, assurent une partie de leurs biosynthèses ; les holoparasites, achlorophylliens, dépendent entièrement de leur hôte mais leur organisme est individualisé et organisé ; les endoparasites sont des holoparasites dont l'organisme, très peu organisé, se développe à l'intérieur des tissus de l'hôte (à l'exception des fleurs). D'autre part, les parasites se localisent diversement sur leur hôte et l'on distingue : les parasites épirhizes, connectés aux racines de l'hôte ; les parasites épiphytes, fixés aux parties aériennes de l'hôte.

La représentation de ces différentes catégories est remarquablement inégale. Près des deux tiers (64%) des espèces parasites sont épirhizes, un tiers seulement étant épiphyte (Fig. 3). L'opinion selon laquelle la première forme de parasitisme est épirhize est l'objet d'un consensus parmi les auteurs (KUIJT 1969 ; OZENDA & CAPDEPON 1979 ; WEBER 1993) ; l'épiphytie résulte d'une spécialisation parasitaire plus poussée.

La disparité des modes de vie est beaucoup plus forte encore. Les espèces hémiparasites, les moins avancées dans le sens de la spécialisation parasitaire, constituent un contingent largement majoritaire puisqu'elles représentent 88% des parasites (Fig. 4) ; elles sont réparties dans toute l'étendue de la classification, depuis les I. Magnoliidae jusqu'aux VI. Asteridae. C'est parmi les hémiparasites que se trouvent les parasites facultatifs, qui représentent le premier stade dans la différenciation du mode de vie parasitaire.

Les espèces holoparasites, beaucoup plus spécialisées, sont peu nombreuses (11% des parasites) ; elles ne se rencontrent que dans les familles classées dans la moitié supérieure de la sous-classe V. Rosidae et les VI. Asteridae, c'est-à-dire la partie la plus évolutivement avancée des Dicotylédones. Quant aux endoparasites, leur mode de vie est le plus différencié dans le sens d'un parasitisme absolu ; elles ne représentent que 1% des espèces parasites et constituent la seule famille des Rafflesiaceae (incl. les Mitrastemmataceae), placée dans la partie supérieure des V. Rosidae (Fig. 5).

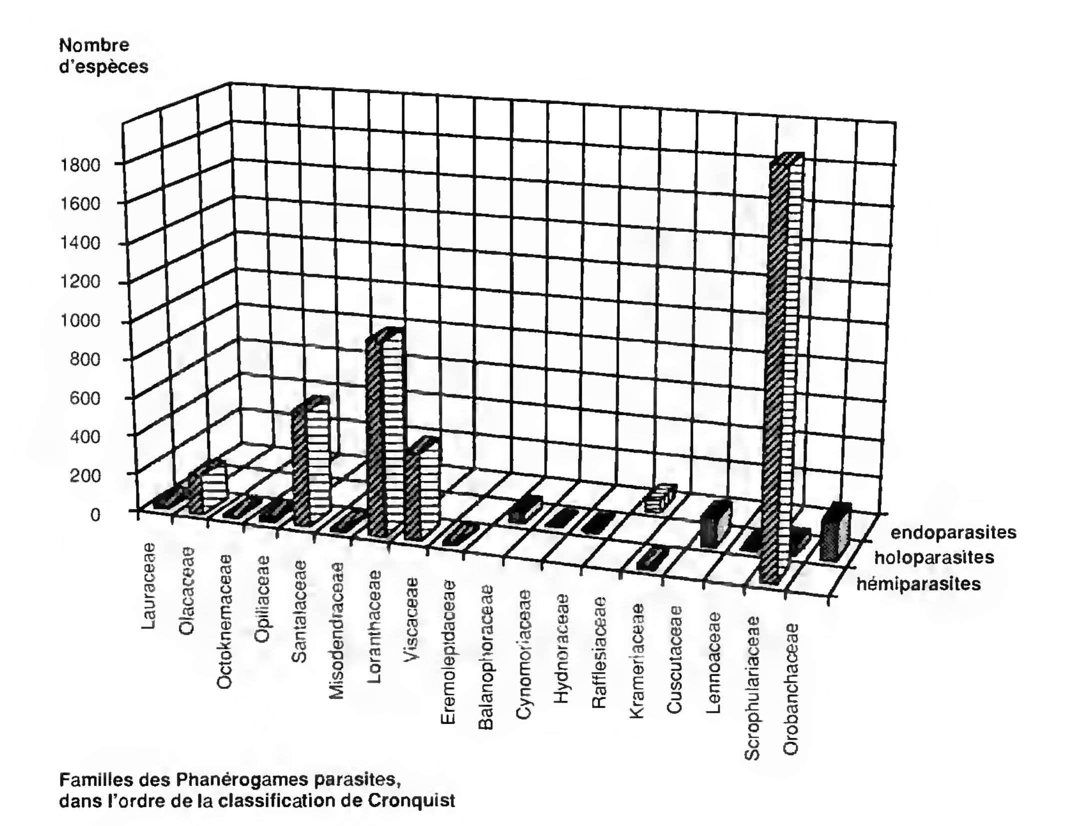


Fig. 5. — Place des modes de parasitisme dans la classification de Cronquist (1981). Les modes de vie les plus avancés, holoparasitisme et endoparasitisme, sont limités aux groupes représentant le sommet de la classification.

Le parasitisme tel qu'il est classiquement défini est ainsi un phénomène propre aux Dicotylédones les plus évoluées (si l'on ne tient pas compte du genre *Cassytha*, marginal à plus d'un titre). L'opinion générale considérant que les Dicotylédones évoluées et les Monocotylédones se sont développées à partir de Dicotylédones primitives, la localisation du parasitisme aux groupes modernes de la classification systématique permet de lui attribuer une origine relativement récente.

La forte représentation de l'hémiparasitisme, dont une partie est un parasitisme facultatif, et de l'épirhizie donnent le tableau général d'un parasitisme au début de sa différenciation ; encore peu d'espèces ont pu atteindre des stades hautement spécialisés, tels que l'holoparasitisme et l'endoparasitisme. On peut supposer que l'évolution vers un parasitisme de plus en plus absolu, et représenté par un nombre plus grand d'espèces, est en cours actuellement.

UN AUTRE TYPE DE PARASITISME : ASSOCIATION DE TROIS PARTENAIRES

Les Phanérogames démunies de chlorophylle, et donc strictement hétérotrophes, sont soit holoparasites, soit mycotrophes.

On admet classiquement que la nutrition de ces dernières se fait, dans la plupart des cas, à partir d'éléments végétaux en cours de décomposition et implique une nécessaire association fongique sans laquelle les plantes ne peuvent absorber leurs nutriments. Il s'agit alors d'une association à deux termes, Phanérogame et champignon, considérée comme une symbiose (« symbiose

mycorhizienne ») dans laquelle les deux partenaires trouveraient chacun un avantage : il ne serait pas alors question d'un parasitisme.

Cependant, et déjà en 1891 (FRANK), il avait été dit que les Orchidaceae se nourrissaient aux dépens du champignon qui leur est associé. Des travaux récents (LEAKE 1994 ; IMHOF & WEBER 1997) montrent que les hyphes du champignon sont rapidement détruits et digérés dans les tissus racinaires de la plante à fleurs. Une telle association binaire semble être, au moins dans de nombreux cas, un parasitisme du champignon par la Phanérogame achlorophyllienne ; cette relation trophique est appelée « mycohétérotrophie » par ces derniers auteurs.

Ce type de parasitisme s'étend parfois à l'exploitation indirecte d'autres plantes à fleurs, par l'intermédiaire du champignon ; mais malgré cette relation à sens unique et à leur profit, ces Phanérogames achlorophylliennes ne répondent pas aux critères définissant le parasitisme au sens strict.

Mycotrophie et parasitisme indirect : le mycoparasitisme

Le *Monotropa*, plante hétérotrophe sans chlorophylle, vit dans la litière de feuilles mortes, sans aucune relation directe avec une Phanérogame : elle présente toutes les caractéristiques d'une plante saprophyte. Un champignon (*Armillaria mellea*) lui est associé ; ce champignon participe aux mycorhizes des arbres environnants (*Abies, Pinus, Fagus*). L'utilisation d'un marqueur radioactif a permis de démontrer (BJÖRKMAN 1960) que l'*Armillaria* prélève des nutriments à l'arbre puis les redistribue au *Monotropa* : on observe une chaîne trophique à trois termes : arbre-hôte — *Armillaria* — *Monotropa*. Ce dernier exploite nutritionnellement l'arbre, son comportement est donc clairement parasitaire, bien qu'aucun contact direct ne s'établisse entre les deux Phanérogames. En conséquence, aucune structure de type haustorium ne se développe, aucune interrelation n'intervient entre eux au cours de leur morphogenèse.

Ce type de parasitisme, appelé « mycoparasitisme » par CRONQUIST (1981) et « épiparasitisme sur les arbres » par BJÖRKMAN (1960), a été de longue date reconnu chez une Polygalaceae (*Salomonia*, PENZIG 1901) et chez quelques Orchidaceae (*Gastrodia* par exemple, KUSANO 1911) ; en 1979, WEBER mettait ce phénomène en évidence dans cette même famille, chez *Corallorhiza*. Plus récemment, et chez une espèce sans chlorophylle de Gentianaceae, une relation à trois termes (un *Voyria* – un champignon – une autre plante à fleurs) a été mise en évidence (IMHOF & WEBER 1997) ; au niveau des contacts entre la racine du *Voyria* et celle d'une autre Phanérogame, on observe une infestation fongique particulièrement dense de la racine de *Voyria* ; on constate en outre le passage direct d'hyphes d'une racine à l'autre.

Le progrès de la compréhension du fonctionnement des populations végétales a amené à considérer qu'un même mycélium, dans le sol, établit des connections mycorhiziennes avec diverses Phanérogames. Ce mycélium fonctionne alors comme un intermédiaire transmettant les nutriments d'une Phanérogame à une autre (WHITTINGHAM & READ 1982 ; FRANCIS et al. 1986 ; IMHOF & WEBER 1997) ; le cheminement des produits de synthèses va, par mycélium interposé, depuis les plantes les plus riches en composés carbonés vers les moins riches (FRANCIS & READ 1984). À l'évidence, les plantes sans chlorophylle ont un besoin impérieux de composés carbonés : elles attirent donc à elles, via le champignon, les ressources contenues dans les Phanérogames autotrophes environnantes.

S'il est démontré que certaines plantes mycotrophes peuvent se nourrir aux dépens d'autres Phanérogames par l'intermédiaire d'un champignon qui leur est associé, il semble bien qu'elles puissent également se nourrir, toujours via le champignon, d'organes végétaux morts (HEAP & NEWMAN 1980). Elles auraient donc un comportement mycoparasitaire facultatif.

L'éventuelle relation avec un hôte associé au champignon étant discrète et facultative, le mycoparasitisme n'est-il pas plus fréquent, chez les plantes mycotrophes sans chlorophylle, qu'il ne le semble ? le phénomène n'a été démontré que chez peu d'espèces (le nombre total peut être estimé à environ une trentaine). Qu'en est-il par exemple chez les *Gymnosiphon* ou les *Thismia* (Burmanniaceae) ou chez les *Sciaphila*

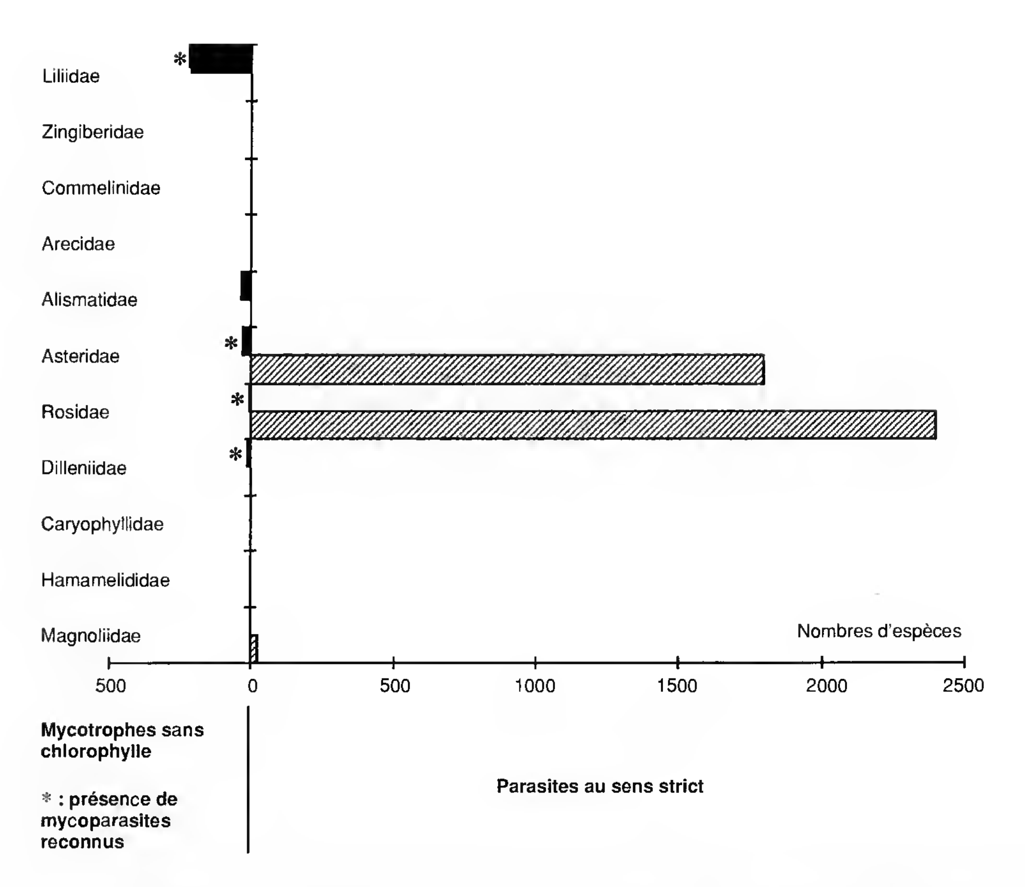


Fig. 6. —Répartition des plantes parasites et des mycotrophes sans chlorophylle dans la classification de Cronquist (1981). Les sous-classes sont énumérées dans l'ordre de la classification, des Magnoliidae aux Asteridae (Dicotylédones) et des Alismatidae aux Liliidae (Monocotylédones).

(Triuridaceae) ? Cette question peut même se poser à l'égard d'autres espèces : la suspicion de mycoparasitisme pourrait peut-être s'étendre à des plantes mycotrophes plus ou moins chlorophylliennes, telles que certaines espèces de *Burmannia* (Burmanniaceae) ou de *Sebaea* (Gentianaceae) ; les observations de terrain montrent que, chez ces plantes, les individus d'une même espèce peuvent être, selon les circonstances, d'un vert plus ou moins pâle, voire totalement blancs. Enfin d'autres Gentianaceae, toujours chlorophylliennes mais présentant des mycorhizes particulières et du même type que celles des *Voyria* (Imhof & Weber 1997), seraient-elles susceptibles de mycoparasitisme occasionnel ? cette question n'a pas de réponse ; mais elle suggère qu'on puisse, à titre d'hypothèse, se demander si le mycoparasitisme n'est pas plus largement représenté chez les Phanérogames qu'il ne le paraît, au vu des rares exemples connus.

L'élargissement du cadre taxonomique sur lequel porte notre réflexion nous amène à rappeler : 1) que ce mode de nutrition, accessoire et facultatif, est nécessairement lié à la mycorhizie ; 2) que des plantes appartenant à des espèces différentes sont interconnectées par l'intermédiaire d'un « canal » fongique commun (Francis et al. 1986) ; dans ce cas, existerait un « mycoparasitisme accessoire » caractérisé par un afflux de nutriments majoritairement orienté vers un partenaire plus que vers les autres ; ce phénomène pourrait intervenir chez de nombreuses espèces, régulièrement, occasionnellement, ou en période de stress par exemple.

Mycotrophie et parasitisme direct

Le rare *Parasitaxus ustus* (Vieill.) Laubenf. (Podocarpaceae) néocalédonien parasite une autre espèce de Gymnospermes (*Falcatifolium taxoides* (Brongn. & Griseb.) Laubenf.) à l'intérieur de laquelle il développe des cordons vascularisés (Köpke et al. 1983) : le parasite et son hôte sont en relation directe. Tous deux sont infestés dans toutes leurs parties par un champignon ; des filaments mycéliens sont toujours présents au niveau des contacts entre les cellules du parasite et de son hôte (Woltz 1994). Ici encore, il s'agit d'un parasitisme impliquant trois partenaires ; on peut supposer que le parasite exige la présence simultanée de l'hôte (réservoir de nutriments) et du champignon (vecteur facilitant le passage des nutriments vers le parasite). Le *Parasitaxus ustus* serait le seul mycoparasite ayant un contact direct avec l'appareil vasculaire de son hôte.

Place des mycoparasites dans la classification systématique

Bien que rarement démontré, le parasitisme indirect à trois partenaires est connu dans l'ensemble de la classification systématique : chez les Gymnospermes, chez les Dicotylédones et chez les Monocotylédones (Fig. 6). Il faut le considérer comme une extension, facultative et peut-être rarement réalisée, de la mycotrophie sans chlorophylle.

Si les Monocotylédones ne contiennent aucun parasite au sens strict (Kuijt 1969 ; Visser 1981 ; Weber 1993), les mycotrophes sans chlorophylle y sont bien représentés : on peut les évaluer à environ 220 espèces, réparties dans six familles : Petrosaviaceae, Triuridaceae, Geosiridaceae, Burmanniaceae, Corsiaceae, Orchidaceae ; parmi elles, seules quelques Orchidaceae sont connues pour être mycoparasites.

Les Dicotylédones mycotrophes sans chlorophylle sont au nombre d'environ une soixantaine, en trois familles : Polygalaceae, Monotropaceae, Gentianaceae. Le mycoparasitisme est connu chez de rares représentants de ces trois familles ; de nouvelles investigations seraient souhaitables pour montrer le caractère exceptionnel, ou au contraire général ou presque, de ce phénomène dans ces groupes.

Enfin les Gymnospermes présentent un cas très particulier de mycoparasitisme. Le *Parasitaxus ustus* néocalédonien est le seul exemple connu de mycoparasite en relation directe avec la vascularisation de son hôte. Le champignon endophyte préside au contact cellule à cellule entre le parasite et l'hôte : les trois partenaires sont toujours associés (Woltz 1994).

Le phénomène mycorhizien, sous la forme d'endomycorhizes, a présidé à l'élaboration des premières formes végétales terrestres ; l'association entre plantes vasculaires et champignons endophytes est connue depuis le Dévonien, voici plus de 400 Ma (Le Tacon & Selosse 1994) ; sous des formes plus diversifiées, les mycorhizes sont très répandues chez les végétaux terrestres : 70% des espèces actuelles en présentent (Weber 1993).

La mycotrophie des plantes sans chlorophylle représente un développement optimal de l'endomycorhizie. Bien que toujours rare, ce mode de vie se rencontre dans des groupes répartis dans l'ensemble de la classification des plantes à graines ; il est relativement bien représenté chez les Monocotylédones.

Le mycoparasitisme apparaît comme une spécialisation dérivée de la mycotrophie, résultant de l'exploitation par le champignon de la sève d'un hôte vivant. Le nombre d'espèces connues pour pratiquer ce type de parasitisme dans lequel interviennent trois partenaires associés est très faible, mais il est possible que d'autres mycotrophes sans chlorophylle soient des parasites discrets, occasionnels et non encore identifiés comme tels.

On observe une séquence progressive continue entre les mycorhizes et l'holoparasitisme très original du *Parasitaxus*.

CONCLUSION

Le parasitisme d'une Phanérogame par une autre Phanérogame correspond à deux phénomènes profondément différents, le parasitisme direct dans lequel les deux partenaires sont seuls en contact, et le mycoparasitisme dans lequel

intervient un troisième partenaire, un champignon endophyte. Ces deux modes de parasitisme doivent être considérés comme étant apparus indépendamment l'un de l'autre ; comme le souligne KUIJT (1969), le parasitisme direct ne peut pas dériver de la mycotrophie.

Les mycoparasites se rencontrent parmi les Gymnospermes et dans l'ensemble des Angiospermes. Ce type de parasitisme, directement dérivé de la symbiose entre plantes vasculaires et champignons endophytes, esr certainement très ancien (BOULLARD & LEMOIGNE 1971). Le nombre total d'espèces connues pour le pratiquer est faible : c'est peut-être un indice de son caractère relicruel ; mais on ne peut exclure l'hypothèse que ce phénomène soit, sous des formes diverses et instables, beaucoup plus fréquent. On l'observe dans des groupes systématiques très divers quant à leurs affinités et leurs caractéristiques évolutives ; il se rencontre dans des familles modernes comme les Orchidaceae aussi bien que, sous une forme très élaborée, chez le *Parasitaxus* qui appartient à un groupe ancien de Gymnospermes (DE LAUBENFELS 1972).

Les parasites au sens strict sont reliés à leur hôte par un haustorium démuni d'endophyte ; ils ne se trouvent que chez les Dicotylédones les plus évoluées, qui semblent seules susceptibles de développer cette adaptation. Ce parasitisme paraît être relativement récent et semble encore à un stade juvénile de son développement ; si les espèces de certains groupes (Rafflesiaceae, Balanophoraceae, par exemple) ont atteint un très haut niveau de spécialisation morphologique et biologique, elles sont peu nombreuses, comparées à celles qui pratiquent un parasitisme partiel et sont relativement peu modifiées par ce mode de vie (Scrophulariaceae par exemple). Il est probable que le nombre d'espèces parasites et le degré d'adaptation au parasitisme soient susceptibles de s'accroître encore notablement. Les Phanérogames parasites pourraient alors devenir un phénomène d'une ampleur insoupçonnable aujourd'hui.

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Manuscrit reçu le 29 mai 1998 ;
version révisée acceptée le 14 septembre 1998.

Renzorchis (Orchidaceae, Habenariinae), a new genus from Gabon

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KEY WORDS
Orchidaceae,
Renzorchis,
taxonomy,
Gabon.

ABSTRACT
A new genus of the subtribe Habenariinae (Orchidaceae), *Renzorchis* Szlach. & Olsz., is described and illustrated. Its taxonomic position is briefly discussed.

MOTS CLÉS
Orchidaceae,
Renzorchis,
taxonomie,
Gabon.

RÉSUMÉ
Un nouveau genre de la sous-tribu des Habenariinae (Orchidaceae), *Renzorchis* Szlach. & Olsz., est décrit et illustré. Sa position taxonomique est brièvement discutée.

According to DRESSLER (1993), the subtribe Habenariinae Benth. (Orchidoideae, Orchideae) includes 932 species and 23 genera. While examining materials to the book on the gynostemium structure in the order Orchidales the senior author came to the conclusion that this group, as many others, is highly polymorphic. Based on the gynostemium morphology, SZLACHETKO (1995) proposed to distribute genera included in Habenariinae *sensu* DRESSLER (1993) between Herminiinae Szlach., Androcorytinae Schltr., Platantherinae Schltr. and Habenariinae *sensu stricto*. We are aware that such genera as *Habenaria* Willd. and *Cynorkis* Thouars are polymorphic themselves, at least as considers the gynostemium and flower morphology, and require taxonomic revisions.

The gynostemium structure in Habenariinae can be defined as follow: stigma bilobed, stalked, forming stigmaphores with the most apical parts fertile; rostellum 3-lobed, both lateral lobes elongated into rostellophores, terminated usually by massive, firm viscidia. Anther with the basal parts forming antherophores, becoming connected apically with rostellophores.

While studying herbarium materials from Gabon we found specimens which looks like *Platycoryne* Rchb. f. After detailed examination,

however, it was obvious that our plants are not *Platycoryne*, and even more, they are not closely related to this genus.

The unique feature of our orchid is the gynostemium structure. Rostellum is 3-lobed, with very long and massive side lobes. Noteworthy is that they produce two small viscidia in their half length. Antherophores are narrow and distinctly shorter than rostellophores, adnate to them mesotonically. In our opinion all these give good background for establishing a new genus for these interesting plants from Gabon.

RENZORCHIS Szlach. & Olsz., gen. nov.

Ab omnibus generibus subtribus Habenariinae *structura gynostemio differt: rostellum trilobatum lobis lateralibus longis, solidis pendulisque viscidia minores in medio formanti; antherophori distincte breviores quam rostellophori in modo mesotonico connati.*

TYPE.—*Renzorchis pseudoplatycoryne* Szlach. & Olsz.

ETYMOLOGY.—Named in honour of Dr. Jany RENZ, Basel, an eminent specialist of Habenariinae.

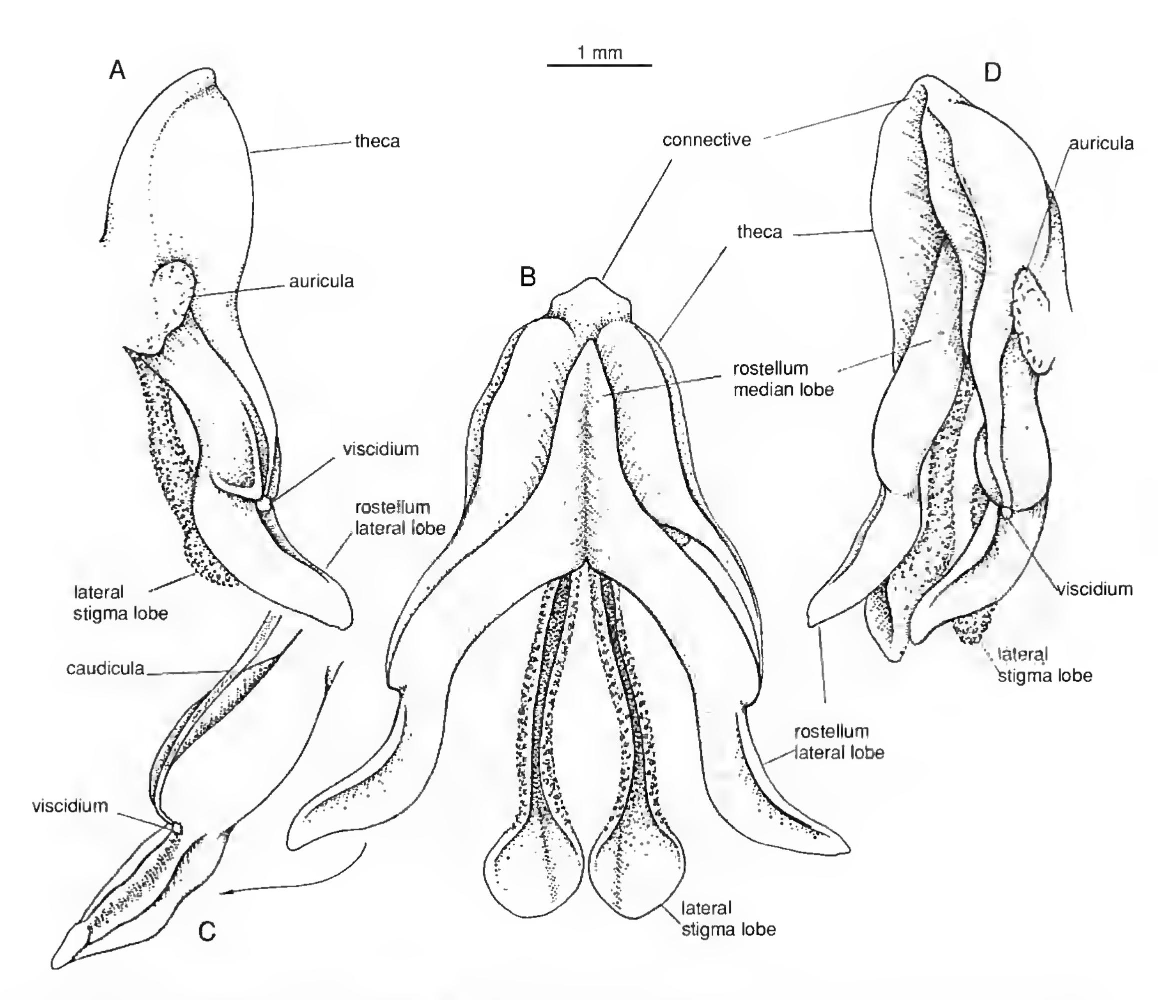


Fig. 1.—The gynostemium structure of the genus ***Renzorchis*** Szlach. & Olsz.: **A**, side view; **B**, front view, spread; **C**, apical part of rostellophore and antherophore; **D**, front view. (SZLACHETKO & RUTKOWSKI, in prep.).

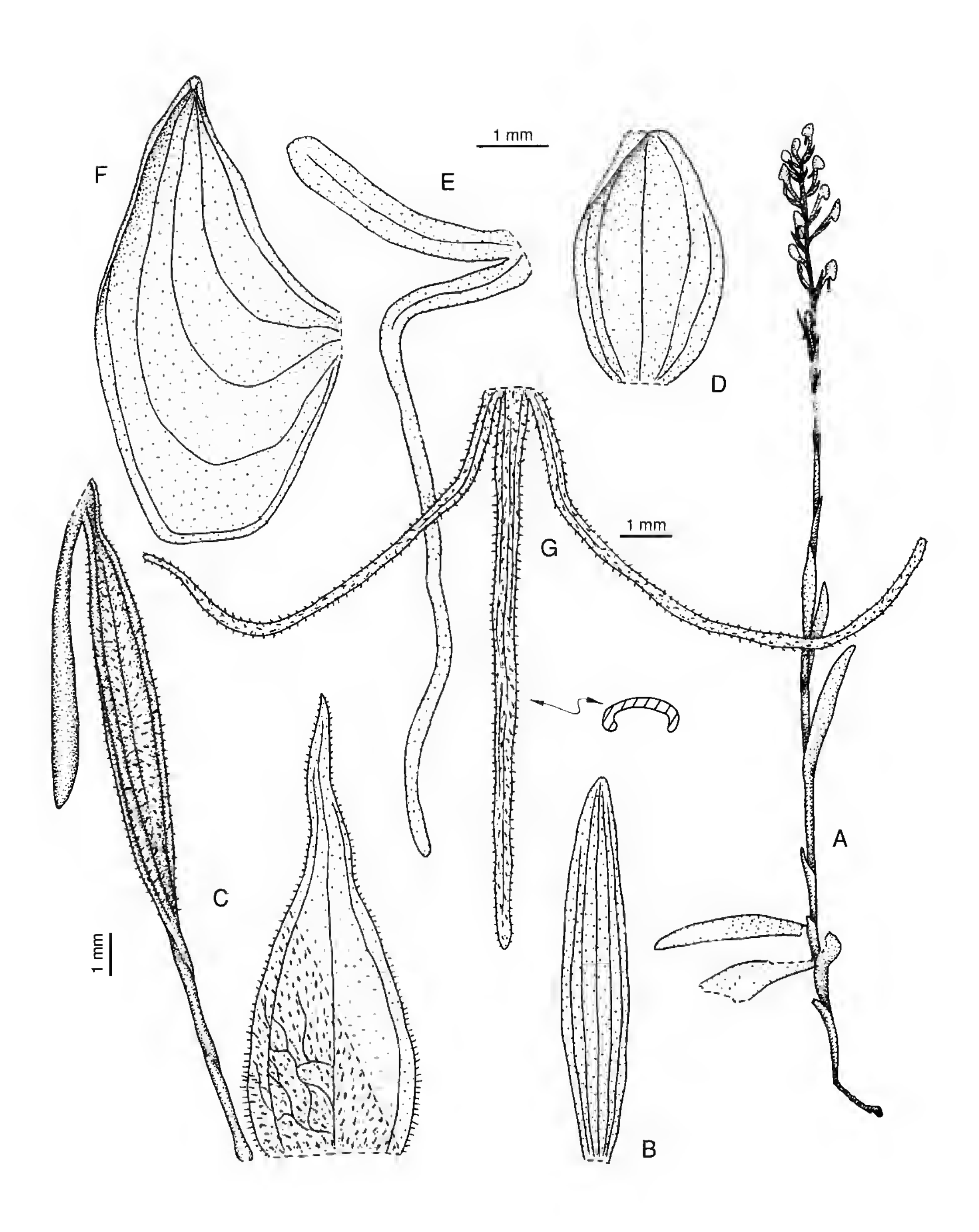


Fig. 2.—***Renzorchis pseudoplatycoryne*** Szlach. & Olsz.: **A**, habit; **B**, leaf; **C**, floral bract, spur, ovary and pedicel; **D**, dorsal sepal; **E**, petal; **F**, lateral sepal; **G**, lip.

The genus *Renzorchis* includes a sole species.

Renzorchis pseudoplatycoryne Szlach. & Olsz., **sp. nov.**

Species unica generis, a habitu generi Platycoryne *similis, sed labello trilobato, lobis laciniatis ciliatisque, petalo fere ad basin dissecto in segmentis inaequalibus duobus et calcare distincte breviori quam ovario pedunculoque.*

TYPE.—*Thollon s.n.*, Gabon (holo-, P).

Plants 35-39 cm tall, erect, glabrous. Leaves 7-8, distributed in the lower third of the stem, up to 7 cm long and to 1.5 cm wide, linear-lanceolate, acute, erect-ascending, passed apically in the culine bracts. Cauline bracts 4-6, up to 2.5(4) cm long, herbaceous, acute, as long as the internodes, apical bracts ciliate along margins. Spike 9-10 cm long, 13-17-flowered, rather lax, multilateral, Flowers rather small, resupinate. Floral bracts 12 mm long, ovate with lanceolate apex, 3-nerved, herbaceous, densely glandular along margins and on adaxial surface, glabrous on abaxial surface. Pedicel 7 mm long, erect, twisted, glabrous. Ovary 11 mm long, papillate. Sepals thin, thickened at apices, glabrous. Dorsal sepal 4 mm long, 2.1 mm wide, cucullate, with 3, branched nerves. Lateral sepals 7.5 mm long, 4 mm wide, oblique ovate, with acute apex, asymmetric. Petals glabrous, unequally bipartite; the uppet part 4 mm long, 0.6 mm wide, linear, obtuse, single-nerved; the lower patt 11 mm long, 0.5 mm wide, lineat, obtuse. Lip 3-lobed, minutely pubescent; lobes divided up to the base; the middle one 11 mm long, 0.4 mm wide, linear, obtuse, 3-nerved; side lobes 9 mm long, 0.3 mm wide, thread-like, obtuse, single-nerved. Spur 7 mm long, narrowly cylindrical-clavate, subacute. Gynostemium sessile. Anther ca. 4 mm long, connective narrow, apical parts of thecae parallel, spreading basally. Antherophores half as long as rostellophores, apically adnate to them. Rostellum 3-lobed, the middle one shorter than connective, triangular, massive; side lobes finger-like, slightly sigmoid, produce viscidia mesotonically. Viscidium small, membraneous. Auricles rather large, ovate. Stigmaphores canaliculate, papillate outside, with expanded apical parts, forming a kind of plates.—Figs. 1, 2.

ETYMOLOGY.—In reference to the *Platycoryne*-like habit.

DISTRIBUTION.—Known so far from Gabon only.

RELATIONSHIP.—In our opinion *Renzorchis pseudoplatycoryne* is only distantly related to *Habenaria* Willd. From any other genus of Habenariinae, it is easily to distinguish by its antherophores as long as the half of rostellophores.

Acknowledgments

The senior author is grateful to the Director of the Laboratoire de Phanérogamie in Paris for the hospitality during personal visits, and as usual, to Prof. Dr. Hab. Ryszard OCHYRA for the translation of the diagnosis. This work was party financed by grant KBN 6P04C-063-15.

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Manuscript received 8 December 1997; revised version accepted 2 October 1998.

Une nouvelle espèce de *Centranthus* (Valerianaceae) endémique de Sardaigne

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RÉSUMÉ
La comparaison des *Centranthus* sect. *Nervosae* de Corse et de Sardaigne a conduit à distinguer deux espèces. L'une, *C. trinervis*, est endémique de Corse, l'autre, endémique de Sardaigne est une nouvelle espèce décrite ici : *C. amazonum*. L'aire de répartition de ces deux espèces est très restreinte : une population d'une centaine de pieds en Corse et une (peut-être deux) d'une trentaine d'individus en Sardaigne. La comparaison des plantes cultivées à partir de graines récoltées dans la nature confirme la distinction taxinomique.

MOTS CLÉS
Valerianaceae,
Centranthus,
Corse,
Sardaigne,
espèces menacées.

ABSTRACT
After comparison between Corsican and Sardinian *Centranthus* sect. *Nervosae*, two species are distinguished. One is endemic to Corsica (*C. trinervis*), the other one is a new endemic species from Sardinia : *C. amazonum*. The two species have narrowly restricted ranges : one population occurs in Corsica with about 100 plants, and one (maybe 2) in Sardinia (about 30 plants). Comparison of cultivated plants from seeds collected in the field confirms the distinction between the species.

KEY WORDS
Valerianaceae,
Centranthus,
Corsica,
Sardinia,
endangered species.

En 1824, VIVIANI découvre une nouvelle espèce en Corse qu'il nomme *Valeriana trinervis*. En 1827, en Sardaigne, MORIS découvre un *Centranthus* vivace qu'il identifie à la plante que VIVIANI a décrite trois ans auparavant en Corse, il le nomme *C. nervosus*, nom illégitime, puisque dans sa description originale il cite *C. trinervis* en synonymie. VIVIANI (1830) et MORIS (1827, 1840-1843) considèrent que les plantes de Corse et Sardaigne sont conspécifiques, mais le premier place l'espèce dans le genre *Valeriana* et le second, dans le genre *Centranthus*. Le binôme *C. trinervis* (Viv.) Bég. sera définitivement adopté peu après la publication de la flore de BÉGUINOT (1903). Plusieurs autres auteurs considèrent que *C. trinervis* est une espèce présente en Corse et en Sardaigne (MORIS 1827, 1840-1843 ; BÉGUINOT 1903 ; ROUY 1903 ; CORRIAS 1978a ; PIGNATTI 1982 ; GAMISANS et al. 1993 ; THIÉBAUD 1996). Dans sa monographie du genre *Centranthus*, RICHARDSON (1975) doute de la présence de cette espèce en Sardaigne ; mais CORRIAS (1978a) confirme la présence de *C. trinervis* en Sardaigne : il a récolté la plante à Oliena en 1974 et retrouvé des échantillons provenant de la Codula di Luna et de Oliena, dont certains récoltés par MORIS en 1828, 1829 et 1852.

À la suite d'un travail sur la conservation de *Centranthus trinervis* (Viv.) Bég. (espèce rare et protégée en France, prioritaire dans la Directive Européenne « Habitat »), nous avons étudié et comparé les populations des deux îles. Elles sont suffisamment différentes pour justifier la distinction de deux espèces, l'une de Sardaigne et l'autre de Corse. La plante de Corse est légitimement nommée *C. trinervis* (Viv.) Bég., mais aucun nom légitime ne s'applique encore à l'espèce de Sardaigne que nous décrivons ici sous le nom de *C. amazonum*.

Centranthus amazonum Fridlender & A. Raynal, **sp. nov.**

Centranthus nervosus Moris, Stirp. Sardoa El., 2 : 4 (1827) pro parte ; Flora Sardoa : 322-323 (1840-1843), tab. LXXVIII-2, nom. illeg.
Centranthus trinervis auct. non (Viv.) Bég. : Béguinot, in Fiori & Paoletti, Fl. Anal. Ital. 3 : 135 (1903), pro parte ; Corrias, Le piante endemiche della Sardegna 26 : 253-257, tab. p. 254 (1978).

Nova species Centrantho trinervi (Viv.) Bég. *similis cum : rupestri habitatione ; foliis integris, oppositis ; floribus cum gibboso calcare et corollae tubo loculoso ; gynodioecia ; perenni natura. A* Centrantho trinervi *differt : caulibus longioribus (longitudo : 45-80 cm versus 35-55) et minus ramulosis, flexilioribus, minore diametro ; lateribus ramulis rarioribus, brevioribus, raro floriferis ; glauca fronde (versus viride) ; angustioribus foliis (4-6(8) plo longioribus quam latioribus, versus 3-4) ; longioribus internodiis et inaequalibus (longitudo : 10-90 mm) ; laxiore inflorescentia ; ovalibus elongatis fructibus et non obesis pyriformibus ; pappo cum minus numerosis setis, longioribus (longitudo : 5 mm) et cum rarioribus barbulis ; elongatis cotyledonibus, non rotundatis, et abrupte constrictis prope base ; calcareo habitatione.*

TYPE. — *Fridlender 443*, Sardaigne, dans les fissures calcaires d'un cañon du Monte di Oliena (Su Thuthurreli), 27 juin 1994 (holo-, P ; iso-, G).

Plante en touffes de 45-80 cm de haut à la floraison, à tiges et feuillage glauques. Les pieds florifères comptent de nombreuses tiges (une cinquantaine sur les beaux individus) mais certains fleurissent avec seulement deux tiges. Fistuleuses dans leur partie supérieure, mais souples et résistantes, les tiges sont peu ramifiées ; rameaux latéraux courts, comportant 3-4 nœuds, rarement florifères. Les tiges mortes se cassent durant l'hiver mais leurs bases desséchées sont encore visibles à la floraison suivante. Entrenœuds caulinaires plus longs et moins nombreux que chez *C. trinervis*. Feuilles généralement 4 à 6 fois plus longues que larges (jusqu'à 8 fois, surtout chez les feuilles supérieures). Les médianes mesurent environ 100 × 18 mm. Bractée généralement absente mais pouvant être très longue (50 mm), étroite ou filiforme. L'inflorescence est séparée des feuilles végétatives par des entrenœuds plus longs que les feuilles ce qui donne aux tiges leur aspect élancé. La floraison commence en mai/juin et les premiers fruits mûrissent en juin/juillet. Akène allongé, étroitement ovale ; pappus de 12-14 soies, moins plumeuses que celles de *C. trinervis* et non ramifiées, mais en revanche plus longues (5-6 mm).

PARATYPES. — *Corrias s.n.*, Monte di Oliena.

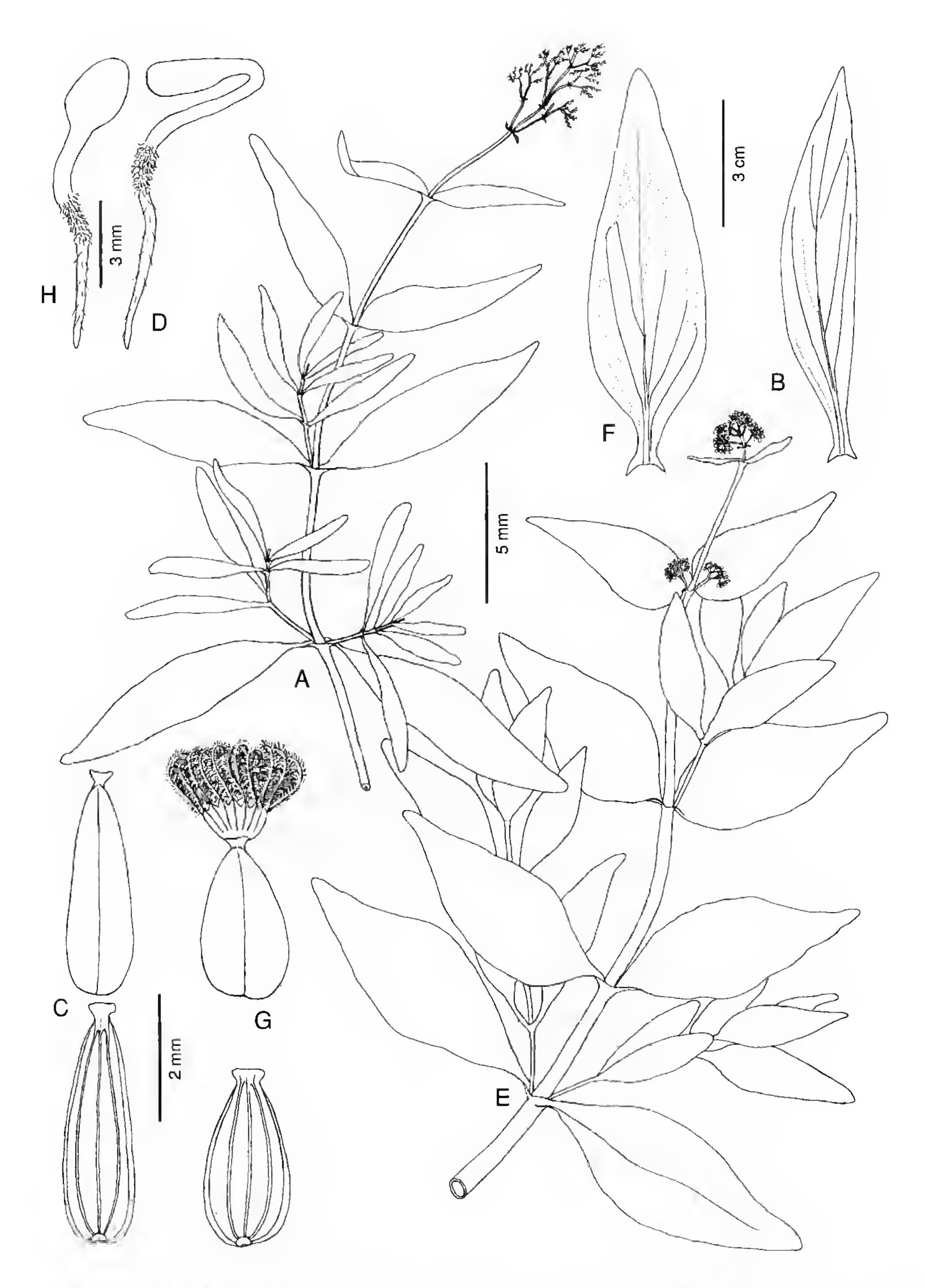


Fig. 1. — ***Centranthus amazonum*** : **A,** rameau fructifère ; **B,** feuille ; **C,** fruit, en haut face ventrale bombée et lisse, en bas face dorsale plate et cannelée ; **D,** germination. — ***Centranthus trinervis*** : **E,** rameau florifère ; **F,** feuille ; **G,** fruit, en haut face ventrale bombée et lisse, en bas face dorsale plate et cannelée ; **H,** germination. (A, B, *Fridlender 443,* ; E, F, *Fridlender 458,* ; C, D, G, H, échantillons cultivés).

Salendo dalla sella verso M. Corrasi, Su Thuthurreli, forra col *Taxus baccata*, 1200 m, 18 et 26 juin 1974 (SS!) ; *Diana & Corrias s.n.*, Monte di Oliena, forra di Su Thuthurreli, 27 sep. 1974 (SS) ; *Diana & Corrias s.n.*, Monti di Oliena, Su Thuthurreli, 27 juin 1974 (SS!) ; *Fridlender 444*, Monte di Oliena, plantes récoltées en culture issues de semis à Paris, 1997, fl. (P!) ; *Marras s.n.*, Pendici di Monte Corrasi, 2 juin 1993, fl. (CAG!) ; *Moris s.n.*, 1828, fl. (BOLO!) ; *Moris s.n.*, " Centranthus nov. spec. Stamen unicum - a Valeriana trinervis Viv. Nec meum ab affini saxatili diversa - legam alii specimen et crittica / in editis montanis ", ex Sardinia, 1827, fl., fr. (BOLO!) ; *Moris s.n.*, in rupestribus montium Oliena, juin 1852, (SASSA) ; *Moris s.n.*, Sardinia, 1828, Hb. Bertoloni (BOLO) ; *Moris s.n.*, Sardinia, 1842 (FI!) ; *Moris s.n.*, Sardinia, 1853, fl. (FI!) ; *Coll. ?*, montagna d'Oliena, mai 1862 (CAG!).

Notes et observations

Une station de *Centranthus* de la section *Nervosae* a été trouvée sur les mêmes calcaires du Nuorense mais à basse altitude (*Arrigoni & Ricceri s.n.*, Sardegna. Urzulei, Codula di Luna. Rupi e rocce calcaree sulla destra del rio, sotto Sa Pala Umbrosa, 30 mai 1968, FI). Bien que n'ayant pas retrouvé la station et n'ayant pas eu accès à la part d'herbier, il semble bien que cette récolte se rapporte à *C. amazonum*.

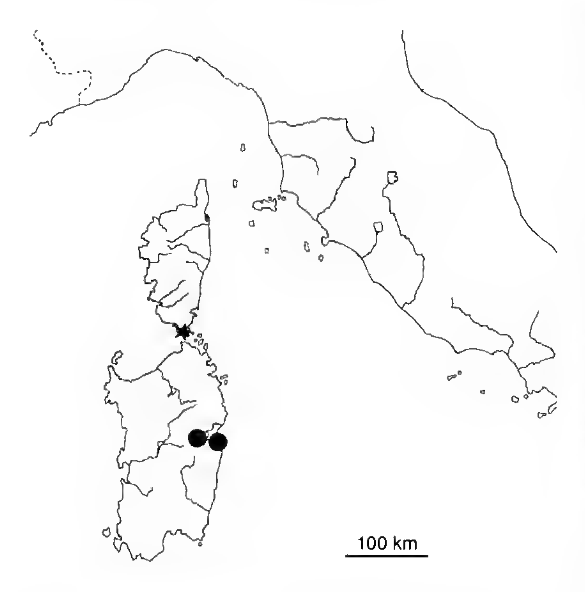


Fig. 2. — Répartition des ***Centranthus*** sect. *Nervosae* : étoile, ***C. trinervis*** ; cercle, ***C. amazonum***.

Le développement de la plante en Sardaigne est conditionné par le climat : l'été sec et l'hiver rude empêchent la croissance qui est brève et rapide au printemps. La germination, l'allongement des tiges ou la floraison sont des événements beaucoup plus synchronisés au sein de la population du Monte de Oliena qu'ils ne le sont chez *C. trinervis* à Bonifacio. Ce phénomène s'observe dans la nature mais aussi en culture.

Cette chasmophyte montagnarde n'est bien connue que d'une station de Sardaigne où elle est endémique. Elle pousse dans quelques fissures des parois calcaires des gouffres et cañons du sommet du Monte di Oliena, vers 1200 m d'altitude, où nous avons inventorié une trentaine de pieds.

Nombre chromosomique : 2n = 32, Monte di Oliena, su Thuthurreli, 1200 m, 26 juin 1974 (CORRIAS 1978b).

Comparaison des deux espèces

La comparaison des populations de Corse et de Sardaigne a mis en évidence plusieurs caractères distinctifs diagnostiques résumés dans la clef ci-dessous, la Fig. 1 et le Tableau 1.

1. Feuilles 4-6(8) fois plus longues que larges, glauques ; tiges florales souples et résistantes dépassant en général 50 cm (45-80) ; fruit ovale allongé ; sur calcaire, Sardaigne ... **C. amazonum**

1'. Feuilles 3-4 fois plus longues que larges, vert luisant ; tiges florifères plus courtes et cassantes, longues de 35-55 cm ; fruit ventru piriforme ; sur granite, Corse .... **C. trinervis**

Certains caractères morphologiques et phénologiques varient avec les conditions du milieu (comme l'altitude). Nous avons donc aussi comparé les plantes des deux populations dans des conditions de culture identiques (FRIDLENDER 1995). Les caractères discriminants entre les deux espèces (phénologie, taille et forme des feuilles) se maintiennent après quatre ans de culture sous châssis (*Centranthus* issus des graines récoltées dans les deux îles en 1994). On constate que les plantes de Sardaigne se distinguent par une germination plus rapide et une croissance des tiges plus grande. Dans de bonnes conditions elles se développent plus vites que celles de *C. trinervis*

TABLEAU 1. — Comparaison entre *Centranthus trinervis* et *C. amazonum* (caractères observés dans la nature).

	C. trinervis	*C. amazonum*
Tiges	Raides cassantes ; les florifères hautes de 35-55 cm	Souples ; les florifères hautes de 45-80 cm
Entrenœuds	Nombreux courts et réguliers	Irréguliers, s'allongent au niveau de l'inflorescence
Rameaux latéraux	Nombreux ; florifères ; se développent jusqu'à l'automne	Peu nombreux ; rarement florifères ; printaniers et estivaux
Feuilles	Vertes, luisantes , largement lancéolées ; 3-4 fois plus longues que larges ; les médianes mesurent 85-100 × 25-30	Glauques ; étroitement lancéolées ; 4-6 (8) fois plus longues que larges ; les médianes mesurent 75-85(100) × 15-20(25)
Bractées	Souvent absentes, mais parfois très développées : 15-20 mm	Plus souvent présentes, mais fréquemment filiformes
Inflorescences	Se développent au niveau du feuillage ; cymes latérales nombreuses : généralement au moins 8	Bien dégagées des feuilles terminales ; cymes latérales moins nombreuses : rarement plus de 6
Floraison	Mai – juin	Juin – juillet
Fruit	Ventru piriforme, long de 2,5–3 mm	Allongé, long de 3-3,5 mm
Pappus	Soies longues de 4(5) mm ; barbules nombreuses (soies très plumeuses) ; 13(12)-15(17) soies	Soies longues de 5(6) mm ; barbules plus espacées ; 12-14 soies
Cotylédons	Arrondis, rétrécis à la base	Allongés, progressivement atténués aux deux extrémités
Écologie	Étage thermoméditerranéen, alt. 140-170 m ; souvent à découvert ; sur granite	Étage montagnard, alt. 1200 m ; cañons ombragés ; sur calcaire
Répartition	Endémique corse	Endémique sarde
Effectif	Une population de ± 100 pieds	Une population de ± 30 individus

qui refleurit souvent à l'automne. Les feuilles de *C. amazonum* sont plus étroites et ont une croissance nettement plus irrégulière. La tige des plantes sardes, plus longue et peu ramifiée, possède des entrenœuds moins nombreux et de longueur également irrégulière ; les inflorescences portent moins de cymes latérales.

Remerciements

Nous tenons ici à remercier chaleureusement B. CORRIAS et S. DIANA qui ont si gentiment accompagné l'un de nous (A.F.) lors de ses premières herborisations en Sardaigne, ainsi que le Prof. A. COUTÉ. Nous remercions également M. MURRACIOLE qui, au sein de l'AGENC, gère les programmes de conservation relatifs à la flore de Corse et nous a permis

d'obtenir un financement par le Conservatoire de l'Espace Littoral (CEL) et l'Office de l'Environnement de la Corse (projet européen Life).

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Manuscrit reçu le 27 avril 1998 :
version révisée acceptée le 7 septembre 1998.

Revision of the genus *Wielandia* (Euphorbiaceae-Phyllanthoideae)

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KEY WORDS
Euphorbiaceae, Phyllanthoideae, *Wielandia*, Seychelles, Madagascar, Comoro Islands.

ABSTRACT
The monotypic genus *Wielandia* (Euphorbiaceae-Phyllanthoideae), long considered to be endemic to the Seychelles, but later found also in Madagascar, and recently in the Comoro Islands, is revised. *Wielandia elegans* var. *perrieri* from Madagascar could not be confirmed as a separate taxon. Showing no adapiations to long-distance dispersal, *Wielandia elegans* presents another example of a species with a relic distribution in the Indian Ocean.

MOTS CLÉS
Euphorbiaceae, Phyllanthoideae, *Wielandia*, Seychelles, Madagascar, Comores.

RÉSUMÉ
Le genre monotypique *Wielandia* (Euphorbiaceae-Phyllanthoideae), longtemps considéré endémique des Seychelles, mais trouvé aussi à Madagascar et récemment aux Comores, est révisé. *Wielandia elegans* var. *perrieri* de Madagascar ne peut être retenu comme un taxon à part. Ne présentant aucune adaptation à une dispersion à longue distance, *Wielandia elegans* illustre un autre exemple d'une espèce à distribution relictuelle dans l'Océan Indien.

INTRODUCTION

Wielandia is a monotypic genus of the Seychelles and Madagascar. It is the type genus of the tribe Wielandieae in the Euphorbiaceae-Phyllanthoideae, which is often considered to be the basal tribe of the subfamily (WEBSTER 1994b: 35). The genus is unique in the Phyllanthoideae in having completely 5-merous, petaliferous flowers in both sexes.

The presumed closest relative of *Wielandia* is the small genus *Petalodiscus* with similar flowers but a 3-locular ovary. Both these genera develop exalbuminous seeds with massive storage cotyledons. This character is found in only three other genera of the subfamily, *Actephila*, *Amanoa* and *Apodiscus* (STUPPY 1996: 150), none of which is well-studied. Other key characters of *Wielandia* are the flattened young branches, the annular floral disc in both sexes and the connate stamens which are crowned by an alternistaminally 5-lobed pistillode.

Noteworthy are the peltate stipules of *Wielandia*, first described and illustrated by FRIEDMANN (1994: 375, pl. 107, fig. 8). The stipules cover the tips of the branches like bud scales and can easily be mistaken for them. They fall off as soon as the leaf grows out, leaving only a very small circular scar. Similar, strongly auriculate stipules, which bridge the gap between the peltate stipules of *Wielandia* and the deltoid or linear ones of other members of the tribe Wielandieae, are found in the genus *Petalodiscus*.

When describing the genus *Wielandia* from the Seychelles, BAILLON (1858: 569) included two elements, *W. oblongifolia* and *W. elegans*. Both were nomina nuda on this page, but the latter name was validated in the atlas appended to this work (p. 40, t. 22, fig. 6-10). Three years later, BAILLON validly published the former name as *Savia oblongifolia* (1861: 35). This species was to become the type of the genus *Blotia* Leandri (1957: 240). In neither of these publications did BAILLON explain the derivation of the generic name. STAFLEU & COWAN (1988: 265) assumed that the genus was named after J.F. WIELAND (1804-1872).

Wielandia remained monotypic but was subsequently found to occur also in Madagascar, and only recently also in the Comoro Islands. For the Malagasy collections, LEANDRI described the variety *perrieri* (1939: 190), for which no distinguishing characters could be established and which therefore is not recognised here.

This revision has been undertaken as part of a systematic study of the Euphorbiaceae-Phyllanthoideae and also represents a precursor for the revised Euphorbiaceae treatment of the 'Flore de Madagascar et des Comores'.

WIELANDIA Baill.

Étude Euphorb.: 568 (1858); Adansonia 2: 32 (1861); Hist. pl. 5: 142, 234 (1874); Benth. & Hook. f., Gen. pl. 3: 270 (1880); Pax in Engl. & Prantl, Nat. Pflanzenfam. 3(5): 16 (1890); Hemsley, Hooker's Icon. Pl. 29: t. 2813 (1906); Hemsley et al., Bull. Misc. Inform. Kew 1919: 130 (1919); Pax & K. Hoffm. in Engl., Pflanzenr., H. 81: 181 (1922); Nat. Pflanzenfam., ed. 2, 19c: 67 (1931); Summerhayes, Trans. Linn. Soc. London., Ser. 2, Zool., 19: 290 (1931); Leandri in Humbert, Fl. Madagascar 111(1): 135 (1958); Punt, Wentia 7: 34 (1962); Köhler, Grana Palynol. 6: 51, 80 (1965); Fosberg & Renvoize, Fl. Aldabra & neighbouring islands: 252 (1980); Friedmann, Flowers & Trees Seychelles: 73, 100, 172 (1986); Levin, Ann. Missouri Bot. Gard. 73: 40 (1986); Syst. Bot. 11: 520-522 (1986); Mennega, Bot. J. Linn. Soc. 94: 114-115, 118 (1987); Muller et al., Trop. Subtrop. Pflanzenwelt 67: 84 (1989); Friedmann, Fl. Seychelles, Dicotylédons: 373 (1994); Webster, Ann. Missouri Bot. Gard. 81: 37 (1994); Stuppy, Syst. Morph. & Anat. Samen biovul. Euphorb.: 183 (1996). —*Savia* Willd. sect. *Wielandia* (Baill.) Müll. Arg., Linnaea 32: 78 (1863); in DC., Prodr. 15(2): 228 (1866).

TYPE.— *Wielandia elegans* Baill.—Fig. 1.

Monoecious shrubs, young branches flattened. Indumentum absent or very scarce, simple. Stipules caducous, peltate. Petiole canaliculate above, vascular bundles cylindrical throughout, adaxially flat to slightly U-shaped, sometimes interrupted by thin strands of collenchyma. Leaves alternate, petiolate, simple, symmetrical, entire, pinnately veined, eglandular. Anticlinal walls of the epidermal cells straight, stomata cyclocytic with 3-6 subsidiary cells.

Inflorescences fasciculate, axillary, borne directly in the leaf axils or on short unbranched (rarely once branched), usually leafless (occasionally bearing a very reduced leaf) axes; pistillate and staminate flowers in the same fascicle. Flowers pedicellate, 5-merous (rarely 4- or 6-merous), pale yellow, greenish white or white. Pedicel inarticulate. Sepals imbricate, quincuncial in 5-merous flowers. Petals imbricate, quincuncial or not, about twice as long as sepals. Disc extrastaminal, annular, margin entire. Stamens episepalous, filaments fused, anthers introrse in bud, reflexed and consequently extrorse at anthesis, longitudinally dehiscing. Pistillode alternistaminally lobed. Styles 2-fid. Stigmas truncate to slightly swollen. Ovules 2 per locule, anatropous (vascular bundle adnate for ca. 4/5 of nucellus length), sharing one 2-lobed obturator.

Fruits capsular, more or less globose, dehiscence septicidal (starting from the base), loculicidal (starting from the apex) and septifragal (starting from the columella); dehiscence of septa irregular; thin exo- and coriaceous mesocarp separate

from the lignified endocarp; septicidal and loculicidal dehiscence complete (into 8-12 parts of endo- and as many parts of mesocarp) or incomplete (whole carpels or the adjacent halves of two carpels staying together). Columella persistent, 4-10 times longer than the narrowest width, acutely 5-angled, base and apex thickened; disc, calyx and stigmas persistent in the fruiting stage. Seeds 1 per locule, ecarunculate, shortly apiculate, perichalazal annulus absent or small and inconspicuous, globose to ovoid (in fruits with aborted locules) to nearly triangular in cross section (in fruits without aborted locules), smooth. Endosperm in mature seeds absent but for a thin membrane. Embryo with hemispherical to hemiovoid storage cotelydons, radicle conical, about as long as wide.

Wielandia elegans Baill.

Étude Euphorb., Atlas: 40, t. 22, fig. 6-10 (1858), for further references see above. —*Savia elegans* (Baill.) Müll. Arg., Linnaea 32: 78 (1863); in DC., Prodr. 15(2): 229 (1866).—Type: *Pervillé 971*, Île Carenga, 12. Nov. 1841, 'communiqué par Boivin', (holo-, P!)

Wielandia elegans Baill. var. *perrieri* Leandri, Notul. Syst. (Paris) 7: 190 (1939); in Humbert, Fl. Madagascar 111(1): 136, fig. 19.1-6 (1958).—Type: *Perrier de la Bâthie 1683*, Madagascar, domaine de l'Ouest, Anbongo, Manongarivo, bois sablonneux, Jan. 1904, (lecto-, isolecto-, P!, chosen here); *syn. nov.*

?*Mespilodaphne sp.*, Baker, Fl. Mauritius: 291 (1877) [based on *Horne 445*].

Shrub or tree 2-20 m tall, up to 15 cm diameter, branches slender, flexible. Young twigs more or less flattened, glabrous. Stipules extremely caducous, strongly involute, peltate, narrowly elliptic, apex and base rounded, 2-9 mm long, 0.5-2 mm wide, glabrous or with very short, rigid hairs. Petiole 3-7(-10) mm long, 0.6-1.5 mm wide, glabrous. Leaves elliptic to ovate, more rarely oblong, apex acuminate-mucronate rarely acute, base acute to rounded, well-defined, (3-)5-9(-15) cm long, (1.5-)2-4.5(-7) cm wide, (1.5-)2-2.5(-3.5) times longer than wide, glabrous, chartaceous to coriaceous, shiny (sometimes less so on lower leaf side), midvein raised above, secondary veins 6-9 pairs below the acumen, finer venation prominent above (especially in young leaves), drying olive-green to greyish green or reddish brown, con- or discolourous.

Inflorescences borne directly in the leaf axils or on axes up to 4 cm long; flowers in fascicles of 2-6 (usually one pistillate and several staminate flowers) per fascicle, up to 20 flowers per leaf axil. Bracts deltoid to slightly ovate, 0.3-1 mm long, 0.3-0.8 mm wide, glabrous or with very short, rigid hairs. Buds globose. Staminate flowers 4-7 mm long, 5-8 mm wide. Pedicel filiform, 5-15 mm long, 0.2-0.4 mm wide, glabrous. Sepals yellowish green, unequal, more or less orbicular, rounded, 1.5-3 mm long, 1.5-3 mm wide, glabrous or with very short, rigid hairs outside, glabrous inside, margin hyaline, entire or erose (probably a drying artefact as in the most recent collections the sepals are entire). Petals pale yellow, obovate to elliptic, symmetrical, rounded, 4-6 mm long, 2-4 mm wide, glabrous, entire or erose, sometimes slightly hyaline. Disc pentagonal from above, 0.5-1 mm long, thinly coriaceous, glabrous. Androecium 1.5-2 mm long, 1-1.5 mm wide, glabrous, filaments fused at the base for ca. 3/4 of their length, their apices bent outwards, anthers basifix, ellipsoid, 0.3-0.4 mm long, 0.25-0.3 mm wide, thecae parallel or nearly so. Pistillode shortly funnel-shaped, 0.2-0.4 mm long, 0.5-1 mm in diameter, glabrous, more or less deeply 5-lobed, lobes usually flatly spread out, rounded to acute, margin erose or glandular. Pistillate flowers 6-10 mm long, 5-10 mm wide. Pedicel terete or slightly flattened, more or less thickened apically, 10-50 mm long, 0.5-1 mm wide at the base, 1-2.5 mm wide at the apex, glabrous. Sepals green, unequal, more or less orbicular, rounded, 2-4 mm long, 2-4 mm wide, slightly accrescent (up to 7 × 5 mm), coriaceous, glabrous or with very short, rigid hairs outside, glabrous inside, margin hyaline, entire or erose (see under staminate flowers). Petals pale yellow with dark marks inside close to the base, obovate to spathulate, sometimes asymmetrical due to imbrication in bud, rounded, 5-7 mm long, 4-7 mm wide, glabrous, margin more or less erose. Disc pentagonal from above, 1-1.2 mm long, thinly coriaceous, glabrous. Ovary

globose, glabrous. Styles canaliculate above, 2-fid in upper third, glabrous.

Fruits solitary, globose, sometimes depressed or elongate, terete or (4-)5(-6)-lobed, sometimes with dorsal ridges along each lobe, often flattened on one side due to abortion of locules, 10-25 mm long, 12-25 mm wide, 0.6-1.4 times longer than wide, green and shiny when fresh, dark brown, dull and papillate or pustulate when dry. Fruiting pedicel usually thickened apically, 10-50 mm long, 0.8-1 mm wide at the base, 1-2.5 mm wide at the apex. Columella 7-15 mm long, 1-3 mm wide in the middle, base thickened to 3-4 mm, apex thickened to 3-7 mm. Exo- and mesocarp together 1.5-2 mm thick when fresh, 0.4-0.6 mm thick when dry, slightly verrucate on inner surface. Endocarp 0.2-0.5 mm thick, light brown. Seeds 8-13 mm long, 5-12 mm wide, raphe more or less impressed, smooth to slightly striate (striation only noticeable upon magnification; possibly an artefact of drying), medium to dark brown, sometimes marbled.

NOTE 1.—The place of publication of this name is often cited as 'Étude Euphorb.: 569. 1858.' (e.g. LEANDRI 1958: 136), but on this page the name is listed without a description and therefore a nomen nudum. The name cannot be regarded as validly published on this page by a 'descriptio generico-specifica' (Art. 42.1 of the Tokyo Code) either, as the genus was at that time not monotypic. It is, however, illustrated with an analytical drawing in the atlas appended to the 'Étude', and thereby validly published according to Art. 44.1 of the Tokyo Code. FRIEDMANN (1994: footnote p. 375) came to the same conclusions with regards to the typification of this name.

NOTE 2.—It can be assumed that the only reason for recognizing this variety was the geographical distance between the Seychelles and Madagascar. This assumption is supported by the lack of a diagnosis in the protologue, as LEANDRI usually stated the differences of his new varieties from the type in this way (e.g. 1939: 189 and 193). For *W. elegans* var. *perrieri*, he provided only a description without differential characters. The only difference found when examining the material from both the Seychelles and Madagascar was that the outside of the sepals, and to a lesser extent the bracts and stipules, are sometimes covered with a very short, rigid indumentum in the Malagasy collections, while they are always glabrous in the material from the Seychelles. This indumentum, however, is not present in either of the syntypes of var. *perrieri*.

ILLUSTRATIONS.— Baillon, Étude Euphorb., Atlas: t. 22, fig. 6-10 (1858), floral diagram of staminate & pistillate flower, pistillate flower, bud, gynoeceum, androecium; the pistillate floral diagram and gynoeceum were reproduced in: Pax in Engl. & Prantl, Nat. Pflanzenfam. 3(5): 16, fig. 11 C-D (1890), Pax & K. Hoffm. in Engl., Pflanzenr., H. 81: 174, fig. 14 C-D (1922) and Nat. Pflanzenfam., ed. 2, 19c: 67, fig. 31 C-D (1931); Baillon, Hist. pl. 5: 142, 234 (1874), floral diagram and longitudinal section of staminate and pistillate flower; Hemsley, Hooker's Icon. Pl. 29: t. 2813 (1906), habit & details of flower, fruit, seed, embryo); Leandri in Humbert, Fl. Madagascar 111(1): fig. 19.1-6 (1958), habit with flowers & fruit plus reproductions of the floral diagrams, androecium and gynoeceum from Baillon 1858; Köhler, Grana Palynol. 6: t. 6, fig. 1-3 (1965), pollen; Friedmann, Flowers & Trees Seychelles: 100, 172 (1986), photo flowers & fruits; Levin, Ann. Missouri Bot. Gard. 73: 41, fig. 1-2 (1986), leaf venation; Muller et al., Trop. Subtrop. Pflanzenwelt 67: 64, fig. 1-7 (1989), pollen; Friedmann, Fl. Seychelles, Dicotylédons: 374, pl. 107, fig. 1-9 (1994), habit, fruit, floral details; Stuppy, Syst. Morph. & Anat. Samen biovul. Euphorb.: pl. 53 A-C (1996), seed, embryo, seed coat.

DISTRIBUTION.—Madagascar, Comoro Islands (Mayotte) and Seychelles (Mahé, Silhouette, Praslin, Aldabra). FOSBERG & RENVOIZE (1980: 252) assumed that *Wielandia* was absent from Aldabra and that the specimen *Fryer 84* must have been mislabelled. *Wielandia* was, however, found on Esprit Island in the Aldabra Atoll in 1983 (*Friedmann 4740*).—Fig. 2.

The dry, explosive capsules of *Wielandia* are clearly autochorous, and the seeds with their thin, dry seed-coat show no apparent adaptation to long distance dispersal. The same applies to all other genera of the tribe Wielandieae. The bio-

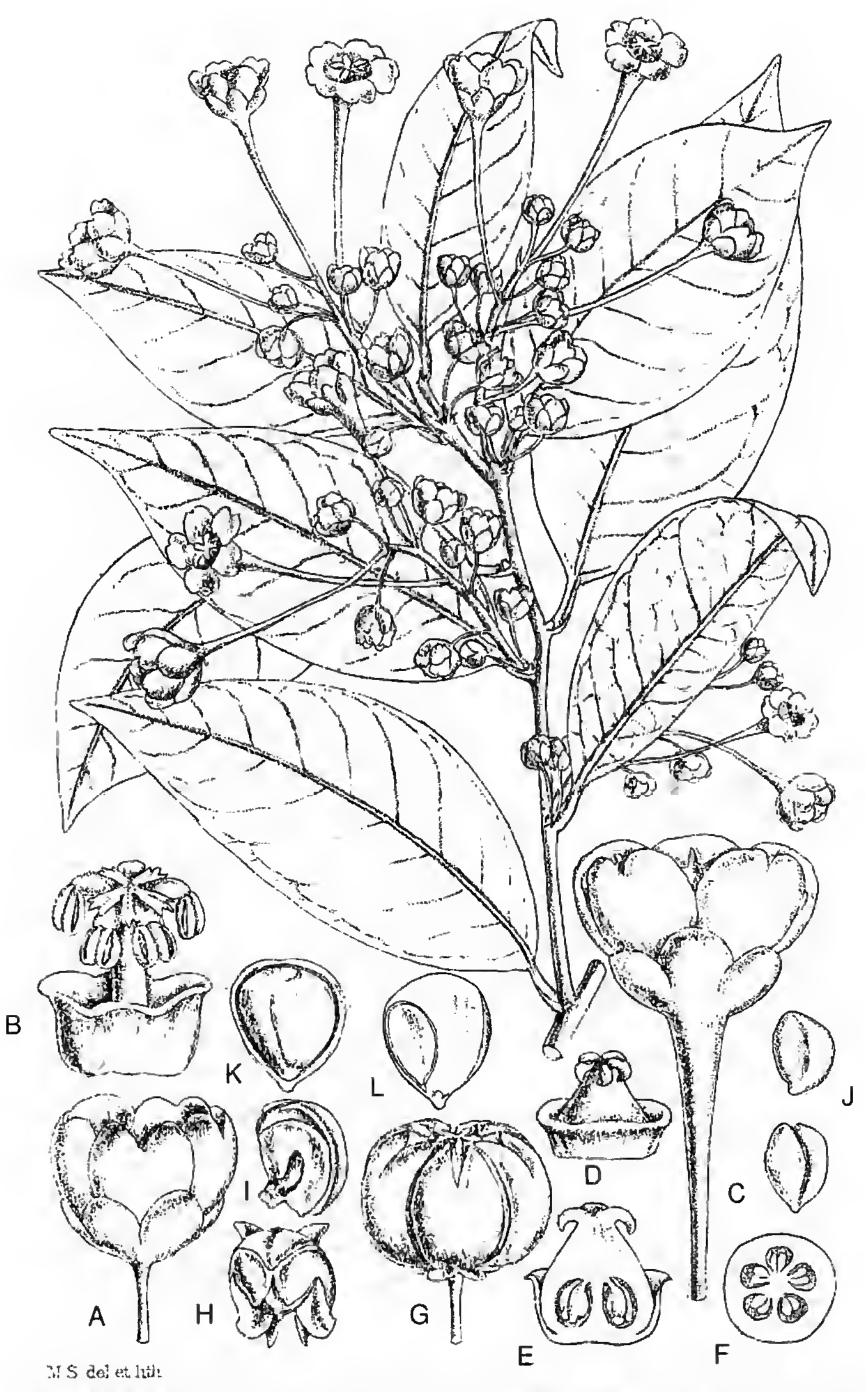


Fig. 1.—***Wielandia elegans***: Reproduced from HEMSLEY 1906. Note that the petals are erose rather than emarginate as pictured here. **A**, staminate flower; **B**, disc and androecium; **C**, pistillate flower; **D**, disc and gynoecium; **E**, longitudinal section of the same; **F**, cross section of the ovary; **G**, ripe fruit; **H**, one of the carpels after dehiscence from the inside; **I**, lateral view of the same; **J**, seeds; **K**, seed, with part of the seed-coat removed; **L**, longitudinal section of a seed. (G-J natural size, the rest enlarged). Drawn from *Thomasset 193*.

geography of the Wielandieae (cf. WEBSTER 1994a: 21-23) therefore suggests both a relatively high age and a relic status for the members of this tribe. The presence of *Wielandia* on Aldabra is of special interest because these islands are said to have been completely submerged only about 100 000 years ago (TAYLOR et al. 1979: 62-63). FOSBERG & RENVOIZE (1980: 2) pointed out that the biological evidence contradicts the geological findings here: "Biologically this seems questionable, because of the extent and differentiation of the flora and fauna". For further discussion on the biogeography of the Seychelles including Aldabra see also FRIEDMANN (1994: 9-15).

ECOLOGY.—MADAGASCAR: in dry deciduous (forêt tropophile), sublittoral and littoral forest and river banks on sand over sandstone, more rarely in humid evergreen forest (forêt ombrophile) on lateritic soil derived from basalt or gneiss, also in deciduous forest on limestone; from sea level to 1600 m altitude. No preferences with regards to bioclimate, altitude, geology or other ecological factors could be recognized.—SEYCHELLES: in undergrowth of forest on coastal slopes, in ravines, often between or on top of granitic boulders, on poor, dry, thin soil; from sea level to 400 m altitude.

The differing ecological behaviour in the two parts of the distribution area is also reflected by the fact that in most Madagascan collections the plant is said to be a tree (max. height 20 m), while from the Seychelles it is known only as a shrub (max. height 6 m).

VERNACULAR NAMES.—MADAGASCAR: Hazomby (*13801-SF*), Janganito (*s.coll. 1655*; *7944-SF*), Tsilikatsifaka (*Rakotoniaina 5184-RN*); Tsimafoitompo (*15605-SF*).—COMORO ISLANDS: M'Tsouakofou (*Pascal 193*), Sari Vavalouza (*Pascal 751*).—SEYCHELLES: Bois fourmi [nom créole] (FRIEDMANN 1986: 100, 172; 1994: 365; *Procter 4002*).

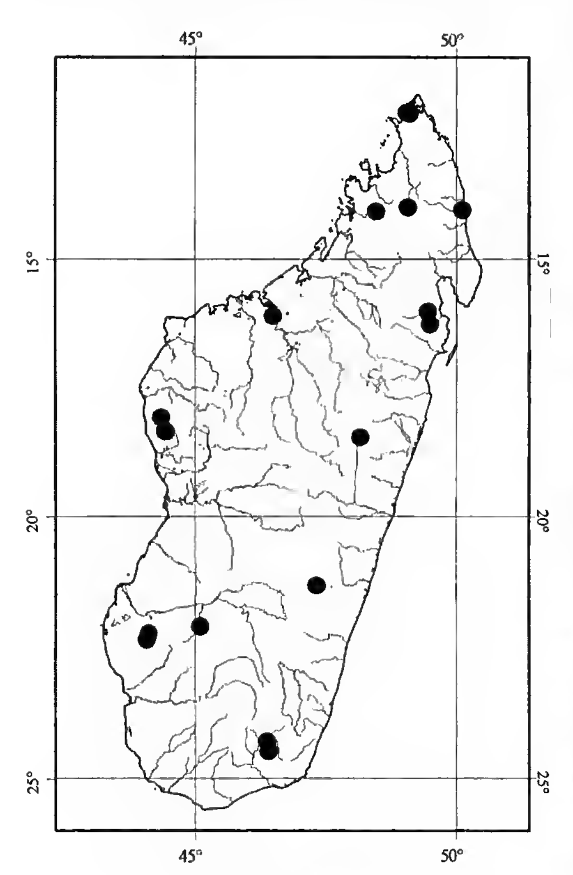


Fig. 2.—Distribution of ***Wielandia elegans*** in Madagascar.

SPECIMENS EXAMINED.—MADAGASCAR: *Capuron 6827-SF*, Ouest, Forêt d'Antsingy, aux environs de la clairière d'Ambodiriana (route Antsalova-Tsiandro), 13 Dec. 1952 (K!, P!); *Capuron 6827-SFbis* (G!, K!, MO!, P!); *Capuron 8524-SF*, Sud (limite E. de l'Androy), entre Imonty et Ambatoabo, bord d'une rivière, 28 Sep. 1953 (G!, K!, MO!, PRE, WAG!, P!); *Capuron 11282-SF*, Centre (Nord), Montagne d'Ambre, vers 1000 m, 8-14 Oct. 1954 (P!); *Capuron 11663-SF*, Ouest, massif greseux de l'Isalo, restes de forêts tropophiles dans la vallée de la Malio, 24 Jan. 1955 (G!, K!, MO!, P!); *Capuron 18328-SF*, Est, environs de la Baie d'Antongil, massif de Farankaraina, entre Navana et Andranofotsy, 0-150 m, 18 Sep. 1957 (G!, K!, MO!, P!, PRE!, WAG!); *Capuron 18735-SF*, Centre-Est, vallée de la Vohomahery, à l'Est de Nosivolo (Canton de Manakambahiny-Est), limite Ouest de la Réserve Naturelle no. 3, 27 Aug. 1958 (G!, K!, MO!, P!); *Capuron 22217-SF*, Ouest, Hara, au Nord de Miria dans le haut bassin de l'Iliona (au NE du massif de l'Analavelona, vers 600-700 m, forêt, sur sables, 16 Dec. 1962 (G!, K!, MO!, P!); *Capuron 23197-SF*, Est (Confins du Centre), près d'Ankarahara, au P.K. 100 de la route Tananarive-Moramanga (rive gauche du Mangoro), vestige forestier, 5 Jan. 1964 (G!, K!, MO!, P!); *Capuron 24000-SF*, Centre, environs de Sandrangato, au Sud de Moramanga, 13 Dec. 1964 (P!); *Capuron 24039-SF*, Est, Ambatoharanana, au Nord de l'embouchure de l'Anove, forêt sublittorale, sur sables, 8 Mar. 1965

(G!, K!, MO!, P!); *Capuron 27705-SF*, Est (Nord), au Sud de Sambava, forêt littorale, sur sables, 1-10 Apr. 1967 (K!, P!); *Decary 1989*, Ankaizinana, 1700 m, forêt, 19 Apr. 1923 (P!); *Humbert 14202*, Analavelona au N du Fiherenana, 950-1250 m, forêt, sur basalte et grès, Mar. 1934 (G!, K!, MO!, P!); *Humbert 28697*, plateaux et vallées de l'Isalo à l'Ouest de Ranohira, 800-1250 m, grès et sables siliceux, 29 Jan.-2 Feb. & 8-10 Apr. 1955 (K!, MO!, P!); *Humbert 28780*, Plateaux et vallées de l'Isalo à l'Ouest de Ranohira, haute vallée de la Malio, 800 m, restes de forêt tropophile, grès et sables siliceux, 29 Jan.-2 Feb. & 8-10 Apr. 1955 (K!, P!); *Humbert 32072*, Environs de Diego-Suarez, Forêt d'Ambre, ca. 1000 m, forêt ombrophile, sur argile latéritique de basalte, 23 Dec. 1959-18 Jan. 1960 (K!, MO!, P!); *Humbert & Capuron 24874*, Montagnes au Nord de Mangindrano (haute Maevarano) jusqu'aux sommets d'Ambohimirahavavy (partage des Eaux Mahavavy-Androranga: Centre-Nord), 1600 m, forêt ombrophile, sur latérite de gneiss, 19 Jan.-12 Feb. 1951 (G!, K!, MO!, P!); *Labat & Deroin 2290*, environs rivière Ambodiria, à l'Est d'Ambinda (RN 9, près d'Antsalova), 18°38'S, 44°42'E, 100-200 m, forêt caducifoliée de bas-fond, sol brun sur calcaire, 4 Dec. 1992 (P!); *Leandri et al. 2162*, Antsingy, vers Ambodiriana, E d'Antsalova, 100-150 m, forêt à feuilles caduques, sur calcaires, rochers isolés, 13 Dec. 1952 (G!, K!, MO!, NY!, P!, PRE!, WAG!); *Leandri et al. 2167*, 6-16 Dec. 1952 (G!, K!, MO!, P!, PRE!, WAG!); *Miller 3617*, Montagne d'Ambre, 1050 m, 21 Oct. 1988 (MO); *Perrier de la Bâthie 1683*, Ouest, Anbongo, Manongarivo, bois, sablonneux, Jan. 1904 (P!), lecto- and isolectotypes of *W. elegans* var. *perrieri*; *Perrier de la Bâthie 2096*, Côte Est, Mananara, forêt littorale, Oct. 1912 (P!); *Perrier de la Bâthie 5940*, Ouest, bords de la Mariano, affluent de droite du Mangoky, bois, sur grès jurassiques, 1911 (P!), syntype of *W. elegans* var. *perrieri*; *R-4 1249bis*, s.loc. (K!, P!); *Rakotomalaza 358*, Station forestière d'Ampijoroa, rive NE du lac Ravelobe, 180 m, 22 July 1995 (MO); *Rakotoniaina 5184-RN*, Sud district, Bezaha canton, RN 11, bord rivière, 7 Apr. 1953 (K!, MO!, P!); *Razafindrakoto 4701-RN*, Antsalova, R.N. 9, 14 Dec. 1952 (P!); *s.coll. 1655*, Canton et district Marovoay, Ampijoroa, JB 4 B, 27 May 1955 (K!, P!); *5966-SF*, Ambinanindrano, Tulongoina, Fort Carnot, 21 Aug. 1952 (P!); *7944-SF*, Marovoay, Ampijoroa, JB 4, 23 Nov. 1953 (K!, MO!, P!); *8057-SF*, Ampijoroa, Marovoay, 11 Dec. 1953 (K!, P!); *11039-SF*, Diego-Suarez, J.B. 19 Roussettes, 13 Nov. 1954 (P!); *13801-SF*, Analavelona, Tulear, 15 Mar. 1955 (P!); *15605-SF*, Ihera-Sakaraha, forêt, 23 Mar. 1956 (P!).—COMORO ISLANDS, MAYOTTE: *Pascal 193*, Mlima Vatounkaridi, 14 Nov. 1995 (P!); *Pascal 751*, Sohoa, 200 m, 7 Nov. 1996 (P!).—SEYCHELLES, ÎLE CARENGA: *Pervillé 971* (communiqué par Boivin), sur les montagnes, 12 Nov. 1841 (P!), holotype of *W. elegans*.—ALDABRA-ISL.: *Friedmann 4740*, Ile Esprit, June 1983 (P!); *Fryer 84*, Aldabra-Isl., s.loc., 1908 (K!).—MAHÉ: *Dupont s.n.*, 1912 (K!); *Procter 4245*, Anse, S side of marsh, sea level, protruding from between granite boulders, Aug. 1972 (K!, P!); *Thomasset 193*, Cascade ?State, Feb. 1905 (K!); *Boivin s.n.*, s.loc., 1847-1852 (P!); *Friedmann 4152*, Glacis, env. 100 m, Apr. 1982 (P!); *G. de l'Ile s.n.*, en allant à la Forêt noire, Mar. 1876 (P!).—MAHE/PRASLIN: *Horne 445*, s.loc., low elevation, poor and dry soils, 1874 (K!).—PRASLIN: *Dupont 62*, Anse ?Badamier, 30 July 1907 (K!); *Friedmann 5404*, pentes Nord de Fond Azore, env. 250 m, Aug. 1985 (P!).—SILHOUETTE: *Bernardi 14639*, La Réserve, 50 m, locus graniticus, asperrimus, ob immania saxa, 2 Nov. 1973 (BM!, K!, NY!, S!); *Bernardi 14658*, per montem 'Corgare', 300 m, 3 Nov. 1973 (P!); *Fitzgerald 6199*, P[re] Civine, forest, coastal slopes, 17 Feb. 1938 (BM!, K!, P!); *Fosberg 52202*, La Réserve, on steep N slope of island, in undergrowth in native forests on talus slope of gigantic boulder, 28 Jan. 1970 (GH!, K!, NY!, US!); *Friedmann 4265*, Jardin Marron, env. 400 m, pousse au sommet d'un rocher, Aug. 1982 (P!); *Friedmann 4500*, Glacis Noel, 300 m, Feb. 1983 (P!); *Gardiner 30*, Point Masson, 14 Aug. 1908 (K!); *Jeffrey et al. 835*, La Réserve, above sea, relict lowland forest on boulder-strewn slopes, 5 Feb. 1962 (P!); *Procter 4002*, La Réserve, 100 m, high growing with *Allophylus pervillei*, *Memecylon*, *Canthium bibracteatum* etc., near edge of rock outcrop, June 1970 (K!); *Procter 4552*, La Réserve, 50 m, growing with *Tarenna*, *Colubrina*, *Nephrosperma*, *Calophyllum* etc., Nov. 1973 (K!).

Acknowledgements

This study was financed by a grant from the Muséum National d'Histoire Naturelle, Paris, for which I am thankful to Prof. Ph. MORAT, director of the Laboratoire de Phanérogamie. I am indebted to the curators and directors of the following herbaria who gave me the opportunity to study their collections: BM, GH, K, NY, P, S and US. I am grateful to F. FRIEDMANN (P) and G. MCPHERSON (MO) for reading the manuscript and for their helpful comments, to S. COMTET (P) for her help with the spelling of the Malagasy localities as well as to Th. DEROIN (P) and J. MUNZINGER (P) for giving me access to the anatomical laboratory. J. MOAT (K) kindly prepared the distribution map.

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Manuscript received 25 May 1998;
revised version accepted 7 September 1998.

New species and new combinations in the genus *Crepidium* (Orchidaceae) from Australasia

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KEY WORDS
Orchidaceae,
Crepidium,
taxonomy,
Australasia.

ABSTRACT
Two new combinations in the genus *Crepidium* Blume, *C. pedicellaris* (Rchb. f.) Szlach. & Marg. and *C. retusum* (J.J. Sm.) Szlach. & Marg., are proposed. Four new species, *Crepidium lyroglossum* Szlach. & Marg., *C. sarawakense* Szlach. & Marg., *C. cribbianum* Szlach. & Marg. and *C. ochyreanum* Szlach. & Marg., are described and illustrated. Their taxonomic affinities are briefly discussed.

MOTS CLÉS
Orchidaceae,
Crepidium,
taxonomie,
Australie.

RÉSUMÉ
Deux nouvelles combinaisons dans le genre *Crepidium* Blume, *C. pedicellaris* (Rchb. f.) Szlach. & Marg. et *C. retusum* (J.J. Sm.) Szlach. & Marg. sont proposées. Quatre nouvelles espèces, *C. lyroglossum* Szlach. & Marg., *C. sarawakense* Szlach. & Marg., *C. cribbianum* Szlach. & Marg. and *C. ochyreanum* Szlach. & Marg., sont décrites et illustrées. Leurs affinités taxonomiques sont brièvement discutées.

The genus *Crepidium* Blume reestablished recently (SZLACHETKO 1995), includes about 250 species distributed in Australasia. It differs from the genus *Malaxis* Sw.—to which most of its species were classified previously—in the gynostemium structure (Fig. 1). The column part of *Malaxis* s.str. is erect, very short and massive, rostellum exceeds distinctly the anther and does not produce any viscid matter; pollinia are parallel in the anther and their apices are well separated. Unlike this, the column part of *Crepidium* is elongate, dorsiventrally flattened, and usually arched; the rostellum is equal in length to the anther and morphologically very similar to both fertile stigma lobes; due to the presence of tiny, sticky caudicles apical parts of pollinia are glued together. At least four other Australasian genera appear to be related to *Crepidium* in respect of the gynostemium structure, but they are easily distinguishable by the lip morphology (SZLACHETKO & MARGOŃSKA, in prep.).

While working with the herbarium materials of Malaxidinae from Australasia we found some specimens which in our opinion represent new species. We describe them below. Two new combinations omitted by SZLACHETKO (1995), are validated here.

Crepidium pedicellaris (Rchb. f.) Szlach. & Marg., **comb. nov.**

Microstylis pedicellaris Rchb. f., Bot. Centralbl. 28: 345 (1886).—Type: *Beccari s.n.*, Niederl Neu-Guinea (holo-, L).

Crepidium retusum (J.J. Sm.) Szlach. & Marg., **comb. nov.**

Microstylis retusa J.J. Sm., Bull. Dep. Agr. Ind. Neerl. 19: 29 (1908).—Type: *Versteeg 1399*, Niederl. Neu-Guinea (holo-, L).

Crepidium lyroglossum Szlach. & Marg., **sp. nov.**

Species haec ad sectionem Pleiodontem *pertinens, plerumque* C. retuso *appropinquat, sed dentibus labelli numeros 6, auriculis lyratis et callo proprio recedit.*

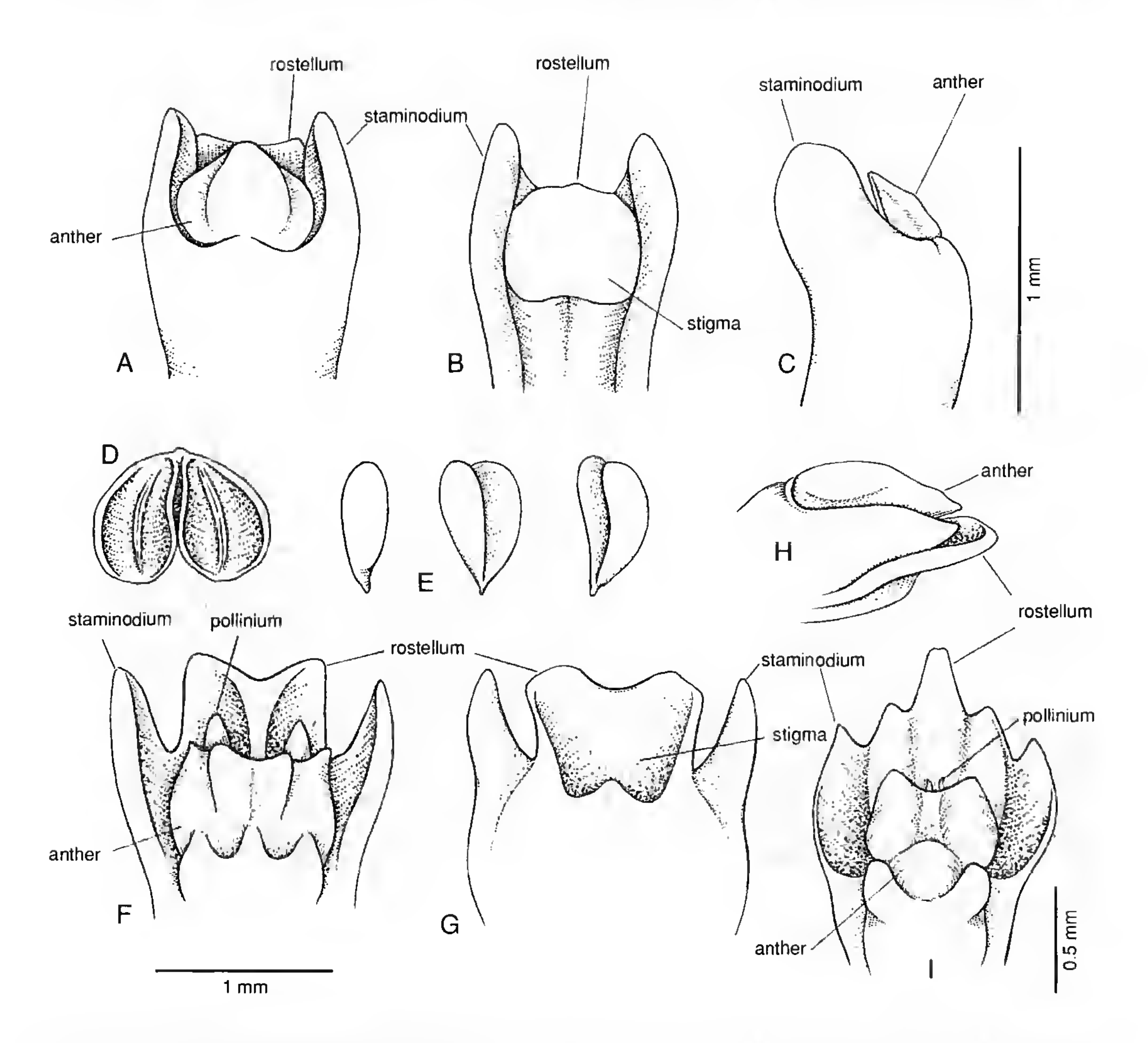


Fig. 1.—A comparison of the gynostemium structure in ***Crepidium*** Blume (A-E) and ***Malaxis*** Sw. (F-I): **A**, **F**, **I**, dorsal view; **B**, **G**, bottom view; **C**, **H**, side view; **D**, anther; **E**, pollinaria.

TYPE.—*Schmutz 4632*, Lesser Sunda Is., Flores, Lengkong, 26 Feb. 1980 (holo-, L).

Terrestrials. Rooted occasionally. Pseudobulbs ca. 13-15 cm long, fusiform to narrowly cylindrical, ascending, internodes several mm long, up to 0.4 cm in diameter. Leaves up to 12; petiole 1.2-2.3 cm long, rather narrow, canaliculate, widening towards the base forming sheath; blade 5.8-7.5 cm long, 1.4-2.8 cm wide, ovate- to broadly lanceolate, acuminate, obscurely asymmetric, more or less undulate along margins. Inflorescence 21-23 cm long, erect, with few longitudinal wings; spike 14-16 cm long, ca. 40- or more-flowered, dense. Flowers non-resupinate, tiny, young flowers green, mature yellow, turned vein-red with yellow points. Floral bracts 3-4 mm long, ovate-lanceolate, acuminate. Pedicel and ovary 3-4 mm long, slender. Dorsal sepal 3 mm long, 1.5 mm wide, oblong-elliptic to oblong-ovate, obtuse, subcucullate, cochleate, thin, delicate, 3-nerved. Petal 3 mm long, 0.8 mm wide, oblong-oblanceolate, widest above the middle, obtuse, single-nerved. Lateral sepals 2.5 mm long, 2 mm wide, elliptic-obovate, slightly asymmetric, cucullate, cochleate, 3-nerved. Lip 4.5 mm long, 4 mm wide, callus foveolate, thin, delicate, at the base of the middle lip lobe; the mid-lobe 2 mm long, 1.6 mm wide, ovate-triangular in outline, distinctly notched at apex up to 0.8 mm; side lobes semi-orbicular, auriculate, with 3 teeth each, teeth narrowly triangular, apiculare, 1-1.3 mm long, auricles 1.5 mm long, lyre-like, obtuse. Gynostemium 1.7 mm long, typical for the genus.—Fig. 2.

ETYMOLOGY.—An allusion to the shape of the lip auricles.

DISTRIBUTION.—Known so far from the type locality only. Collected in forest, ca. 1100 m.

NOTES.—This species appears to be related to *Crepidium retusum* (J.J. Sm.) Szlach. & Marg. of the section *Pleiodon*, but differs from the latter in the lip form. It has 6 teeth on the lip close to the base of the middle lobe, basal lip auricles are lyre-curved. The central lip callus consists of two small foveas near the base of the lip middle lobe.

Crepidium sarawakense Szlach. & Marg., **sp. nov.**

Species haec ad sectionem Pleiodontem *pertinens,* C. ripario *et* C. retuso *affinis, sed prior species a nostra lobo centrali semirotundato retusoque dentibus lateralibus ab eo longioribus et sepalis lateralibus concavis, altera petalis apice retusis et dentibus longis distinguitur.*

TYPE.—*Chai & Seng S-16195*, Sarawak, Numpang, Tai Ton, Kuching, 15 Dec. 1965 (holo-, L).

Terresrrials. Pseudobulbs ca. 7-13 cm long, fusiform to narrowly cylindrical, ascending to erect, internodes some to several mm long, 0.2-0.4 cm in diameter. Leaves 4-7; petiole 1.6-2.8 cm long, canaliculate, widening towards the base forming a prominent sheath; blade 3.8-11.4 cm long, 1.9-3.1 cm wide, ovate- to oblong-lanceolate, acuminate, slightly asymmetric. Inflorescence 19-24.5 cm long, erect, with few longitudinal wings; spike 5-7.5 cm long, ca. 30-80-flowered, dense. Flowers small, nonresupinate, buds pale green, petals and stigma yellow. Floral bracts 2-6.5 mm long, triangular or triangular-lanceolate, acute to acuminate. Pedicel and ovary 4.5-5 mm long, slender, erect. Dorsal sepal 3 mm long, 1 mm wide, oblong-elliptic, obtuse, slightly cochleate in the centre, 3-nerved. Petals 2.8 mm long, 0.7 mm wide, ribbon-like to linear-oblanceolate, truncate or slightly notched at apex, slightly falcate, single-nerved. Lateral sepals 2.5 mm long, 1.1-1.2 mm wide, oblong-elliptic to elliptic, asymmetric, distinctly cucullate, cochleate, shortly apiculate, 3-nerved. Lip 4.5 mm long, 2.8 mm wide, central cavity surrounded by prominent rim; the middle lobe 0.7 mm long, 1 mm wide, semi-orbicular, obscurely notched at apex, side lobes obliquely ovate-triangular, auriculate, with 3 teeth of unequal length each, the longest teeth 1 mm long, linear-lanceolate, acute, auricles 1.2-1.5 mm long, obliquely triangular, obtuse. Gynostemium 1.1 mm long, typical for the genus.—Fig. 3.

ETYMOLOGY.—In reference to the place of origin.

DISTRIBUTION.—Known so far from the type locality only. Collected on limestone slope, ca. 450 m.

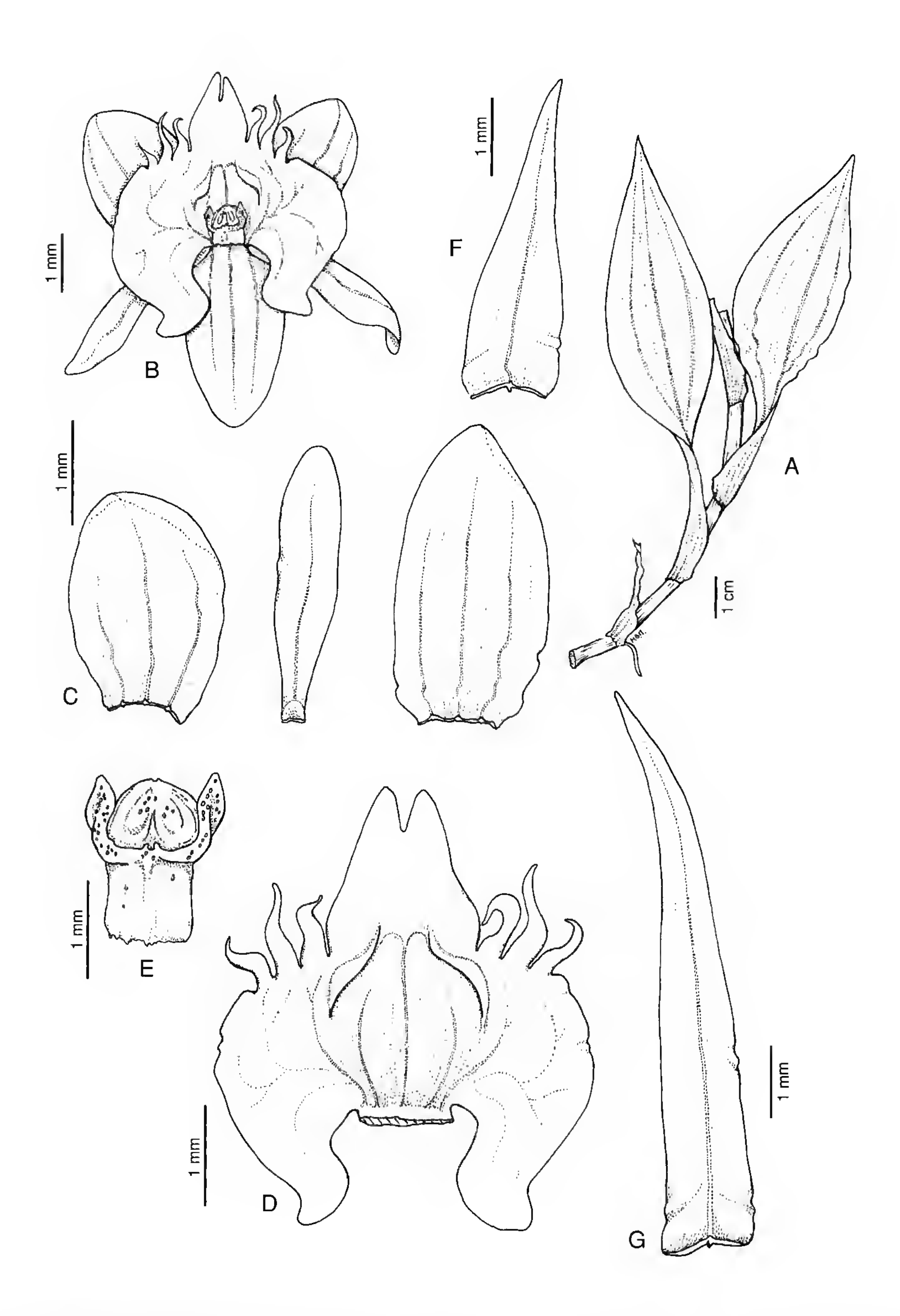


Fig. 2.—***Crepidium lyroglossum*** Szlach. & Marg.: **A**, part of the pseudobulb and leaves; **B**, flower; **C**, tepals; **D**, lip; **E**, gynostemium; **F**, **G**, floral bracts. (Holotype, L).

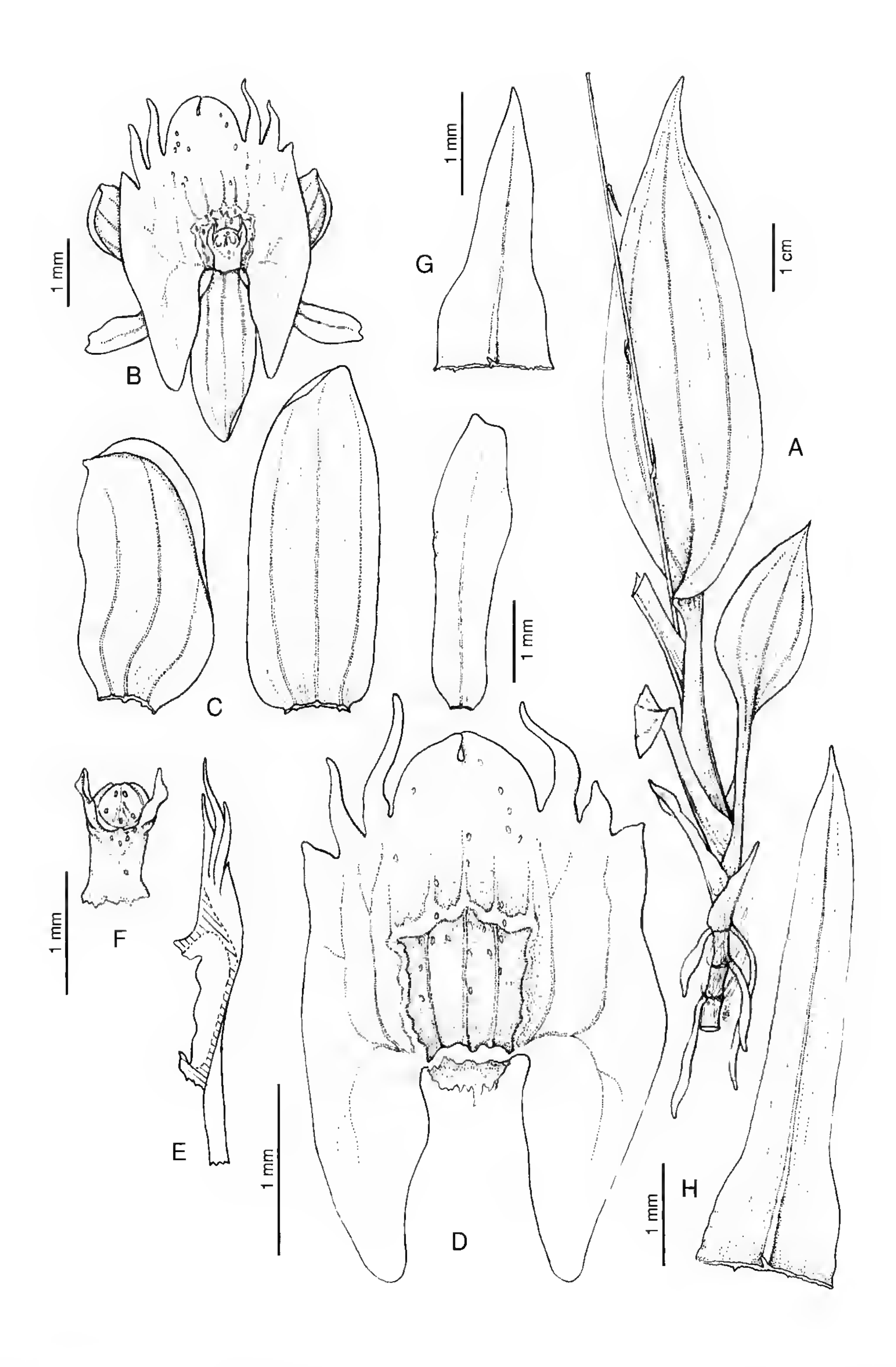


Fig. 3.—***Crepidium sarawakense*** Szlach. & Marg.: **A**, habit; **B**, flower; **C**, tepals; **D**, lip; **E**, longitudinal sections of the lip; **F**, gynostemium; **G**, **H**, floral bracts. (Holotype, L).

NOTES.—This species belongs to the section *Pleiodon* and appear to be related to *Crepidium riparium* (J.J. Sm.) Szlach. and *C. retusum*. It differs from the former in having semi-orbicular and obscurely notched lip middle lobe, with longer tooth and in distinctly concave lateral sepals. It is distinguishable from the latter by the long lip tooth and by apically truncate or slightly notched petals.

Crepidium cribbianum Szlach. & Marg., **sp. nov.**

Species haec ad sectionem Pleiodontem pertinens, *a* C. leucodonti *forma tepalorum et lobis lateralibus labelli brevioribus recedit; a* C. commeliniifoliae *forma et labellum cum tepalo proportione diversa et a* C. taurinae *auriculis labelli non imbricatis recedit.*

TYPE.—*Chai S-35905*, Sarawak, foot of Apo Dari, Kelabit Highland, Baram District, 17 Nov. 1974 (holo-, L).

Terrestrials. Pseudobulbs 4-8 cm long, erect, slender, fusiform, 0.1-0.32 cm in diameter. Leaves 6-16; petiole 1-1.6 cm long, canaliculate, broadly sheathing basally; blade 2-2.8 cm long, 1-1.25 cm wide, ovate, acuminate, slightly asymmetric. Inflorescence 10-16 cm long, with few longitudinal wings; spike 8-12 cm long, 20-40-flowered, dense towards the apex. Flowers small, non-resupinate, brownish-yellow. Floral bracts up to 5 mm long, oblong-lanceolate to transversely elliptic with triangular apex. Pedicel and ovary 2.5-3.5 mm long, slender. Dorsal sepal 3 mm long, 1.6 mm wide, oblong-obovate, rounded at apex, slightly convex in the centre, 3-nerved. Petals 2.5 mm long, 1 mm wide, oblong-spathulate, slightly asymmetric, truncate, single-nerved. Lateral sepals 2-2.5 mm long, 2 mm wide, more or less broadly and obliquely obovate, rounded at apex, slightly concave, obscurely 3-nerved. Lip 3-3.2 mm long, 3.4 mm wide, central cavity surrounded by obscure rim; the middle lobe 1 mm long, 1.5 mm wide, orbicular-ovate in outline, with two small, obtuse lobules at apex; side lobes obliquely triangular-ovate, auriculate, with single tooth at the base of the mid-lobe, tooth 0.5-0.7 mm long, 0.2 mm wide, linear-triangular, apiculate, auricles 2 mm long, triangular, obtuse. Gynostemium 0.8 mm long, typical for the genus.—Fig. 4.

ETYMOLOGY.—Named in honour of Dr. Phillip J. CRIBB, an eminent orchidologist.

DISTRIBUTION.—Known so far from the above-mentioned locality only. Collected in primary forest, on slope at 1320 m.

NOTES.—*Crepidium cribbianum* is similar to *C. leucodon* (Schltr.) Szlach., from which it differs by the form of tepals and shorter lip auricles. It is distinguishable from *C. commelinifolium* (Zoll. & Morren) Szlach. by the shape and proportion of lip and tepals, and additionally from *C. taurinum* (Rchb. f.) Szlach. by non-crossing lip auricles.

Crepidium ochyreanum Szlach. & Marg., **sp. nov.**

Species haec C. melanophyllo *similis, sed dentibus labelli apice obtusis, dentibus lateralibus singularibus, auriculis attenuatis et dentibus lobi centralis semiapertis recedit.*

TYPE.—*Brass 27056*, Fergusson Is., Mts. between Agamoia and Ailuluai, 9 June 1956 (holo-, L).

Terrestrials. Pseudobulbs ca. 4.5 cm, narrowly cylindrical, erect, internodes 0.23-0.45 mm in diameter. Leaves 3-4; petiole 0.3-0.6 cm long, sheath-like; blade 5.3-8.6 cm long, 2.6-3.8 cm wide, ovate to ovate-cordate, apiculate, slightly asymmetric. Inflorescence 33 cm long, with longitudinal wings; spike 12 cm long, 60-80-flowered, dense towards the apex. Flowers small, nonresupinate, brownish-yellow. Floral bracts 3.5-10.2 mm long, narrowly triangular, acute. Pedicel and ovary 4.5-6.5 mm long, slender, erect. Dorsal sepal 4.5 mm long, 2.1 mm wide, oblong-obovate, obtuse, slightly convex at apex, 3-nerved. Petals 4 mm long, 1 mm wide, linear- or oblong-lanceolate, obscurely falcate or sigmoid, obtuse, single-nerved. Lateral sepals 4 mm long, 2 mm wide, obliquely and oblong obovate, obtuse, cochleate, obscurely 3-nerved. Lip 4-5 mm long, 3.5-4 mm wide, central cavity surrounded by prominent rim; the middle lobe

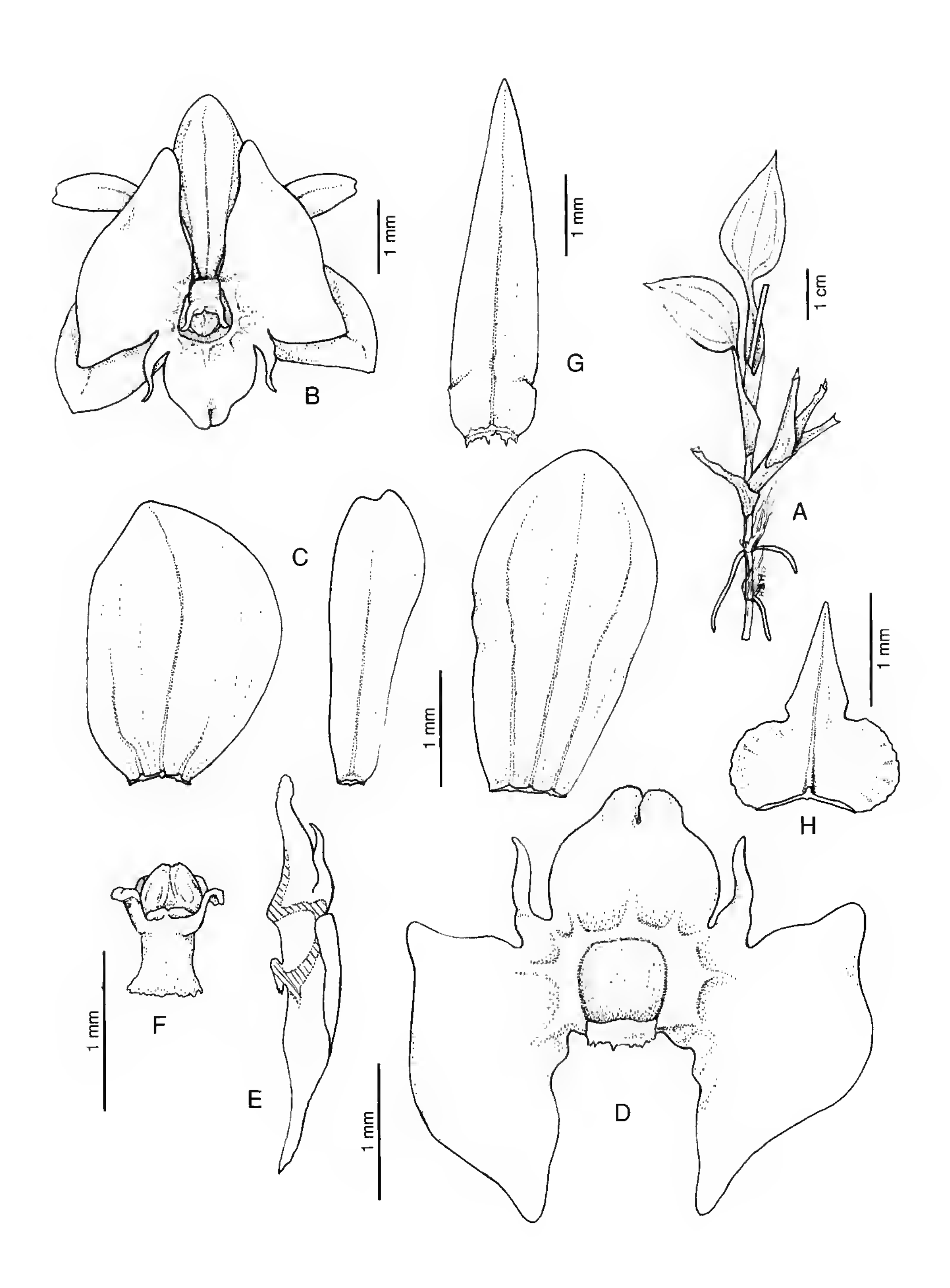


Fig. 4.—***Crepidium cribbianum*** Szlach. & Marg.: **A**, habit; **B**, flower; **C**, tepals; **D**, lip; **E**, lip, longitudinal section; **F**, gynostemium; **G**, **H**, floral bracts. (Holotype, L).

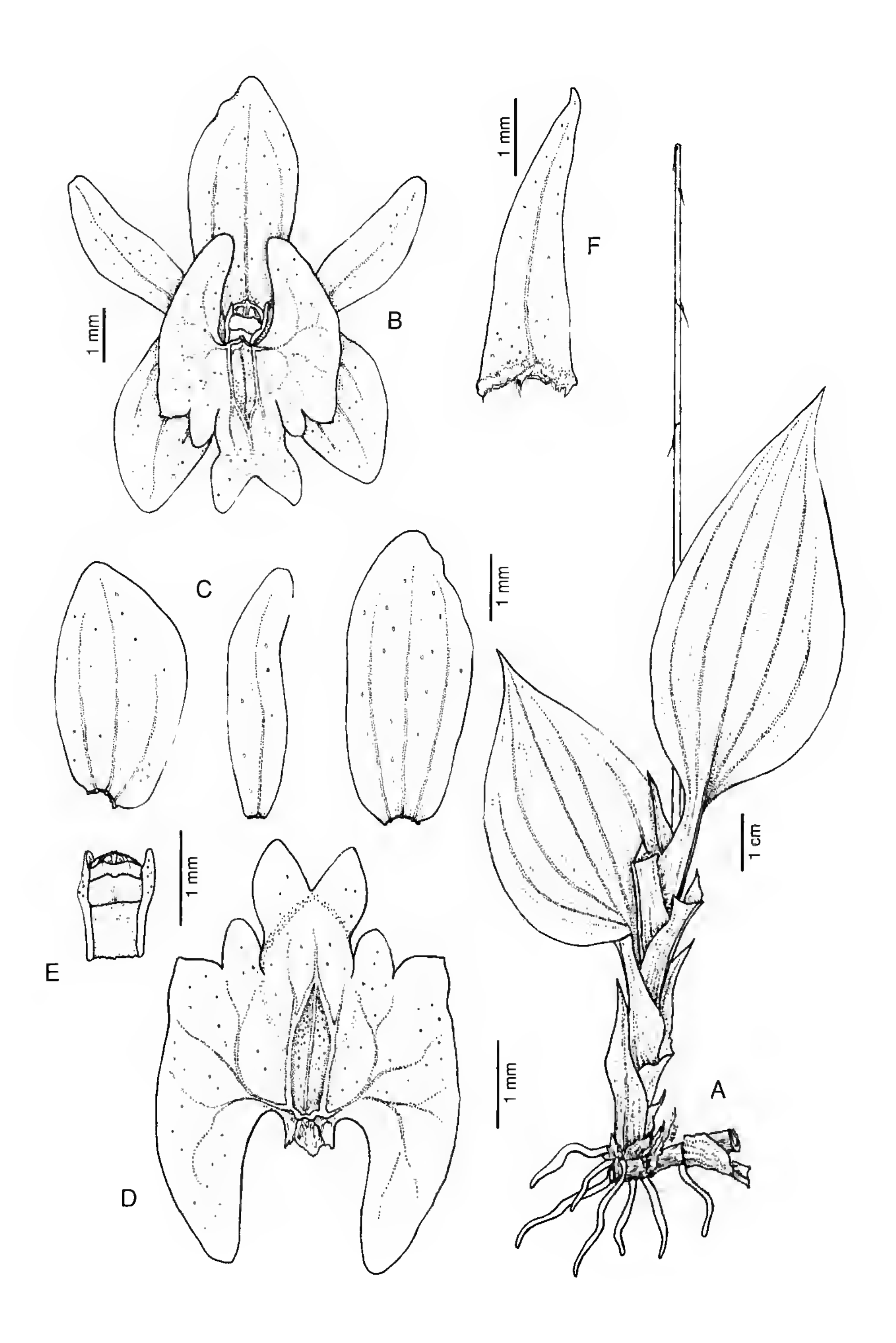


Fig. 5.—***Crepidium ochyreanum*** Szlach. & Marg.: **A**, habit; **B**, flower; **C**, tepals; **D**, lip; **E**, gynostemium; **F**, floral bract. (Holotype, L).

2-2.1 mm long, ca. 1 mm wide, split in the apical half into two divergent, subacute, obliquely ovate lobules; side lobes oblong-ovate-falcate, obtuse, with single tongue-like tooth at each side of the middle lobe, auricles 1 mm long, obliquely ovate-triangular, obtuse. Gynostemium 1.2-1.3 mm long, typical for the genus.— Fig. 5.

ETYMOLOGY.—Dedicated to Prof. Dr. Hab. Ryszard OCHYRA, an eminent Polish bryologist.

DISTRIBUTION.—Known so far from the type locality only. Collected on mossy ground in forest at 900 m.

NOTES.—This entity is similar to *Crepidium melanophyllum* (Schltr.) Szlach., but lobules of the lip mid-lobe are obtuse and divergent, and auricles narrowed gradually towards apices. There is also a single, obtuse tooth on each side of the middle lobe.

Acknowledgments

We are grateful to the Curators of BM, HBG, K, P and W for their hospitality during our personal visits, to the Curator of L for the loan of the herbarium materials and to Prof. Dr. Hab. Ryszard OCHYRA for the latinization of the diagnoses. This work was financed by grant KBN 6P04C-063-15.

REFERENCE

SZLACHETKO D.L. 1995.—Systema Orchidalium. *Fragm. Florist. Geobot.*, Suppl. 3: 1-152.

Manuscript received 8 December 1997;
revised version accepted 2 October 1998.

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Packaging Éditorial

Achevé d'imprimer
sur les presses de l'Imprimerie Durand
28600 Luisant (France)
Dépôt légal n° 10349

Printed on acid-free paper
Imprimé sur papier non acide

Date de distribution : 22 décembre 1998

Ce fascicule a été réalisé avec l'aide de la Délégation Générale à la Langue Française

Accredited with the International Association for Plant Taxonomy for the purpose of registration of new names of vascular plants (excluding fossils)

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1998 • 20 (2)

Conception Graphique : Isabel Gautray

ISSN : 1280-8571

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